Sales Crusade Opens In 19 More Cities

(Concluded from Page 1, Column 3)

"Words don't count," Mr. Davis said. "Only action will bring results. And this action must be started at once."

Henry W. Burritt, vice president of the Kelvinator division of Nash-Kelvinator, outlined the background of the "Sales Mean Jobs" campaign and the results so far obtained in the several cities in which the drive has been started.

The campaign, he said, has its basis in five simple truths:

1. Unemployment is a national problem.

2. The ability to buy, though dormant, still exists.

3. The way to relieve unemployment is to sell more goods and services to those people who are now employed.

4. By stimulating buying power, the salesman can be of great help in turning the wheel of industry past the "dead center" position.

5. No matter who starts the movement back to prosperity, all industries will be helped—because what helps business helps all.

All elements of American industry are invited to join in the movement, Mr. Burritt said.

President George W. Mason, in emphasizing the important part which the salesman plays in the life of existing industries and the creation of new ones, said:

"Electric refrigeration became an industry because of the salesman. He created a desire for a new product, something people wanted but didn't know it."

In telling of the campaign's results in the trial city, Lincoln, Neb., Dana Cole, president of the Lincoln chamber of commerce, said:

"The campaign has given our sales people a new idea of the importance and dignity of salesmanship. It has done more than that. It has given the people of Lincoln the same appreciation.

He commended the crusade to chambers of commerce in other cities, he said, because:

1. It has no strings tied to it.

2. Results justify the amount of effort required to put a community at work.

3. There are no fancy trimmings to the plan. It is a simple program of hard work, coupled with the creation of a proper mental attitude on the part of the public.

4. Its objectives are of such a character as to contribute a proper civic activity. Not for the advantage of any class or group, but for the benefit of all.

5. It works.

Fred W. Sargent, president of the Chicago & Northwestern Railway Co., told of the effect of increased sales on transportation and related industries. Business and government should lay aside their animosities and cooperate to bring back better times, he said.

Cities besides Detroit and Chicago in which the crusade got off today were:

Cincinnati; Clarksburg, W. Va.; Cleveland; Columbus, Ohio; Des Moines, Iowa; Erie, Pa.; Kalamazoo, Mich.; Kansas City, Mo.; Lansing, Mich.; Louisville, Ky.; Salt Lake City; San Francisco; Oakland, Calif.; Welch, W. Va.; Wheeling, W. Va.; Richmond, Va.; and Seattle.

On Thursday of this week, another 20 cities will begin their participation in the campaign, with the principal meeting in Milwaukee and a telephone hook-up with the other city meetings.

Inaugurating the drive at that time will be Atlanta; Birmingham, Ala.; Boise, Idaho; Billings, Mont.; Charleston, W. Va.; Dallas; Denver; Houston; Huntington, W. Va.; Knoxville, Tenn.; Los Angeles; Nashville, Tenn.; Oklahoma City; Peoria, Ill.; San Antonio, Tex.; Shreveport, La.; Sioux Falls, S. D.; Spokane; and Springfield, Mo.

Refrigeration Of Foods Will Be Described At International Conference In London

(Concluded from Page 1, Column 2)

present an address, "The Design and Operation of Large Gas Stores."

In the afternoon program, besides the discussion by Dr. Plank and Mr. Sinclair, there will be a talk on "Air Conditioning Problems" and the following discussions:

"An International Unit of Refrigeration," by Dr. E. Altenkirch, Berlin, Germany.

"Standard Tables for the Properties of Refrigerants," by Dr. E. Schmidt, Braunschweig, Germany.

REFRIGERATION COMMISSION

Officials of the International Institute of Refrigeration also have announced the appointment of Commission No. 7, covering research, teaching, general economics, statistics, and legislation. Presidents of the commission are M. Ch. Brasart, director of agriculture in the ministry of agriculture, Paris; and Dr. Ing. e. h. E. Altenkirch, director-in chief of the Journal of the Refrigeration Industry, Berlin, Germany.

Members of the commission are: from Germany—Dr. Ing. J. S. Cammerer, Leutstetten, Oberbayern; Prof. Dr. W. Meissner, Technical High School, Laboratory for Technical Physics, Munich; Prof. Dr. Ing. R. Plank, director of the Technical Refrigeration Institute of the Technical High School, Karlsruhe.

From Canada—M. E. F. Burton, director, Department of Physics, McLennan Laboratory, University of Toronto, Toronto.

From the United States—David L. Fiske, secretary of American Society of Refrigerating Engineers, New York City; J. F. Nickerson, general secretary of American Institute of Refrigeration, Chicago; George F. Taubeneck, editor of AIR CONDITIONING & REFRIGERATION NEWS, Detroit.

From France—M. A. Barrier, chief engineer of the Military Institute, and honorary director and consultant to the International Institute of Refrigeration, Paris; M. Mironneau, associate professor of the Superior School of Refrigeration, Versailles.

From Great Britain—Jos. Raymond, honorary secretary of the British Association of Refrigeration, London.

From the Dutch East Indies—Dr. Ing. C. P. Mom, professor of the Superior Technical School, Bandoeng.

From Italy—Dr. Ing. Alessandro Mascini, vice director of the Experimental Institute of Communication, Rome.

From Japan—H. Honda, superintendent of Science and Art Section, Department of Education, Tokio; Prof. Kamo, Imperial University of Tokio, president of the Japanese Association of Refrigeration, Tokio.

From Poland—Dr. Ing. G. Stefanowski, professor of thermodynamics of the Superior Technical School of Varsovie.

From Switzerland—Prof. Ch. Colombi of the University of Lausanne, Lausanne.

From Jugoslavia—Prof. Dr. Ing. F. Bosnjakovic, Zagreb.

THE COLD CANVASS

By B. T. Umor

(Concluded from Page 1, Column 1)

for consumption by anyone suffering from the heat or excessive perspiration.

Results were supposed to be astounding. Immediately, the patient's temperature would drop 10 or 20°, depending on the dose.

Pills were to be manufactured in one, two, five, and 10° capacities, so that exactly the amount of cooling desired could be obtained. Before putting the pills on the market, where every person in the country could buy a box a month at a dollar a throw, the Kingfish decided to go scientific and try the pills on a guinea pig.

The poor little pig froze to death—a martyr to science.

* * *

Ice Box For Eskimos

There seems to be simply no end to this business of "selling an icebox to an Eskimo."

Now it's Jim Moran, the land lubber who flew across the continent last February to harpoon the whale that was trapped in San Francisco bay, who is going to try to turn the trick.

Moran, who claims that in the course of his business career he has sold everything from magazines to airplanes, breezed into Detroit recently to make a deal with some local refrigeration company before hopping off by ship, plane, and dog sled for the Arctic.

The icebox, he stipulated, must be one with "Eskimo sales appeal," which he said must include controlled temperature and humidity, ability to run on a gasoline motor-generator, and a few other things besides being cold. Furthermore, he stated, it must be small enough to be shipped by airplane.

Queried as to the purpose underlying the attempt, Morgan replied: "Well, I've sold nearly everything else, so I thought I'd try this thing that everyone says is impossible."

Abraham & Straus Offers To Accept Trade-Ins With Appraisals Based On Hantober's Index

(Concluded from Page 1, Column 4)

tinues, "is now in a position, after a year of exhaustive study of the refrigerator market, to make this possible! Through the cooperation of a nationally known appraiser we have been able to set valuations on 1,192 different models of mechanical refrigerators, covering 36 different makes.

"Tell us the make of your box, and the model number (usually printed on the back) and we will quote you an exact valuation.

"Every refrigerator manufacturer will admit that he knows how to build better refrigerators today than he did seven years ago, five years ago, or even one year ago. Many refrigerators now in use are consuming from two to seven times as much current as a 1938 model.

"When an automobile owner finds his car is costing him too much in gas and depreciation, he trades it in and gets an up-to-date model. Why shouldn't refrigerator owners be able to do the same thing?

"It is good business to trade in your refrigerator. In some cases the savings in electric current will almost take care of the monthly payments. And in every case, you and your family will benefit enormously from the new improvements."

The advertisement continues to list the 36 makes on which valuations have been set, and to urge refrigerator owners to check their old boxes point for point against any of the modern models.

Heads of the advertisement run as follows: "We will allow you up to $75 trade-in value on your old refrigerator! Trade-in allowance ranges from $4 to $75—in a few exceptional cases it is even as high as $150."

The "nationally known appraiser" mentioned in the advertisement is the "National Market Index of Trade-In Values for Used Refrigerators" published by Herman Hantober, formerly official appraiser for members of the Refrigerator Association of New York.

It has not yet been announced whether or not other stores in the A.M.C. group, of which Abraham & Straus is a member, will adopt the trade-in plan, but it was made clear that the idea is purely an A. & S. project and entirely optional as far as the other stores are concerned.

For Information on Motors
FOR ALL TYPES OF
Air Conditioning and Refrigeration Equipment
WRITE TO
Wagner Electric Corporation
6441 PLYMOUTH AVE ST. LOUIS, MO

BUNDY TUBING
Copper-Brazed Steel. Copper Coated Inside and Out. Sizes: 1/8" to 5/8" O.D.
BUNDY TUBING CO., DETROIT

Do You Want a Canadian Representative?
Electrical and air conditioning lines wanted.
Established company with sales organization.
BEASLEY'S (Canada) AGENCIES
542 Danforth Avenue, Toronto, Ont., Can.

MODERN . . .
CABINET INSTALLATIONS USE

A-P VALVES . . .

Fresh meat, attractively cut and temptingly displayed in a beautiful modern display cabinet, promotes more sales and faster sales than the old fashioned "chopping-block" method of piece-meal selling. But the finest of refrigeration engineering is necessary to preserve its freshness and quality, — its "eye appeal."

Manufacturers of modern Display Cabinets and Walk-In Coolers specify A-P Thermostatic Expansion Valves for this task with complete confidence. They know that the inherent sensitivity of the A-P Expansion Valve results in closer control of temperature and relative humidity.

Installing engineers have learned that with an A-P Valve on the job there are fewer "call-backs" for service and adjustment. A-P Accuracy and Leakproof Dependability always mean more profit to the service engineer — satisfaction to the customer.

Refrigeration parts jobbers, who recognize quality, stock A-P controls.

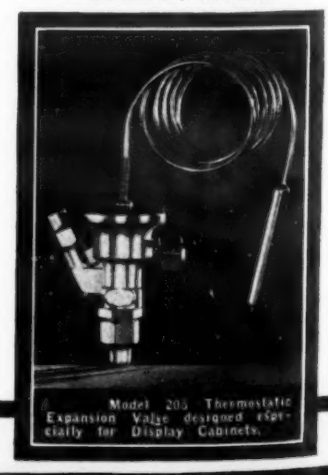
Installation . . .
A. J. Wichman Market
Evanston, Illinois

Cases and Cooler . . .
Campbell Refrigerator Co.
Milwaukee, Wisconsin

Refrigeration Unit . . .
YORK

Valves . . . (A-P)
7 Model 205 Thermostatic Expansion Valves

Purchased through . . .
Refrigeration Specialty Co.
Milwaukee, Wisconsin



Model 205 Thermostatic Expansion Valve designed especially for Display Cabinets.

AUTOMATIC PRODUCTS COMPANY
2450 NORTH THIRTY — SECOND STREET
MILWAUKEE WISCONSIN
Export Department, 100 Varick Street, New York City

DEPENDABLE
THE BYWORD FOR A-P VALVES

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Air Conditioning & Refrigeration News

The Newspaper of the Industry

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THE COLD CANVASS

By B. T. Umor

No More Dormitories

Many members of the American Society of Refrigerating Engineers who met at State College, Pa., last week were reminded of their college days. Only part of the attendance could be accommodated at the attractive Nittany Lion Inn, and all others were quartered in dormitories just vacated by the students.

Various comments indicated that the facilities were as good as those available when the engineers went to school, but it was also clear that the ASRE men have become accustomed to much better standards of living since that time.

Many reminiscences of college experiences naturally came to light. One engineer was reminded of the time that the commissary of his fraternity bought a barrel of some kind of dried fish at a bargain price. When the fish was served for the sixth consecutive dinner, the brethren rebelled.

Another engineer was reminded of the time his fraternity house dormitory became infested with sea-going bed bugs. Putting the legs of the beds in cans of water failed to stop the invasion.

Said one prominent member of the society: "Well, I never went to college, so I can't appreciate this dormitory stuff. Let's have the next meeting at a first-class hotel with plenty of **baths, bell hops,** and **bars.**"

That viewpoint seemed to meet with unanimous endorsement. So it will probably be a long time before the ASRE decides to refresh its memories of undergraduate living

(Concluded on Page 16, Column 1)

Rentschler Offers 'Sterilamp' Data To Engineers

By Phil B. Redeker

STATE COLLEGE, Pa. — Just exactly how and to what extent the Westinghouse "Sterilamp" will be used in conjunction with refrigerators in the preservation of foodstuffs remains something of a matter of conjecture, but many points regarding the operation and functions of the "death ray" lamp for bacteria were cleared up when Dr. H. C. Rentschler, one of the two men who directed the development of the lamp, addressed the American Society of Refrigerating Engineers at their semi-annual meeting here last week.

Great interest was shown in Dr. Rentschler's talk, and a number of those attending declared privately that the interest stimulated in the lamp by previous articles about it appearing in AIR CONDITIONING & REFRIGERATION NEWS had been a principal reason for their attendance

(Concluded on Page 6, Column 4)

Display Units Target Of N. Y. Fire Inspector

NEW YORK CITY — Inspectors from the New York City Fire Department last week renewed complaints against several dealers and department stores on a charge of violating the section of the city ordinance specifying that household refrigerators must be displayed in air-tight rooms, unless the refrigerant has been removed from them.

In one instance, at Bloomingdale's department store, complaint by Fire Department inspectors caused tem-

(Concluded on Page 6, Column 1)

Space Sale for January Show Opens July 10

CHICAGO — Public offering of space in the first annual all-industry Refrigeration and Air Conditioning Accessories Exhibition, to be held in the Stevens hotel here Jan. 16 to 19 inclusive, 1939, will be made on July 10, according to M. W. Knight, sales manager of Peerless of America, Inc., and chairman of the exhibition committee.

Exhibit space in the show will be available to all persons or firms who have a bona fide interest in the refrigeration and air-conditioning industries and trades, Mr. Knight said. Spaces are being assigned in the order in which applications are received.

Sponsored by Refrigeration Supplies & Parts Manufacturers Association, the exhibition is designed to attract the attendance of service men, refrigeration supply jobbers, ice cream service managers, refrigerator dealers and distributors, air-conditioning and installation contractors, and manufacturers of display cases, water and milk-cooling equipment, ice cream cabinets and units, air-conditioning units, beverage coolers, and household refrigerators.

(Concluded on Page 9, Column 4)

Warren To Operate Larkin Coil Firm

ATLANTA—All assets and real estate of Larkin Refrigerating Corp., coil manufacturer, have been purchased by the Warren Co., manufacturer of commercial refrigeration equipment, and will be operated as

(Concluded on Page 16, Column 2)

Standard Will Use 'Free Cooking' As Campaign Theme

TOLEDO—"Free Cooking"—that's the slogan of the electric range campaign being conducted by Standard Electric Mfg. Co. under the direction of H. D. Laidley, recently appointed vice president in charge of sales.

This campaign, which will be used to show housewives that electric cooking offers unequaled advantages in convenience as well as in economy, is based upon the premise that the current-saving devices of the automatically controlled electric range, coupled with other engineering features, actually effect such economies that "Free Cooking" is, figuratively speaking, possible.

The campaign will be carried on through consumer, trade, and direct-mail advertising. Use of the catch phrase "Free Cooking" is expected

(Concluded on Page 2, Column 4)

Office Employes Give Reactions To Cooling

By Henry Knowlton, Jr.

HOT SPRINGS, Va. — General satisfaction with working conditions in an air-conditioned office building, appreciation of relief from the cumulative effects of hot weather, and a minimizing of many adverse factors often attributed to the effects of an air-conditioning system on human comfort, were discovered from a questionnaire sent to 274 employes working in air-conditioned offices in Minneapolis during 1937.

Results of the study, sponsored by the committee on research of the American Society of Heating &

(Concluded on Page 3, Column 1)

'Dictator' Issue Dodged As Dept. Store Men Meet

CINCINNATI, June 28—(Special to AIR CONDITIONING & REFRIGERATION NEWS)—Apparently too hot to handle, the subject: "Should the Electrical Appliance Industry Have a Dictator?" did not come up for discussion tonight at the mid-year convention of the National Retail Dry Goods Association, as scheduled. Billed on advance programs as the piece de resistance, no speaker could be found to put the ball into play.

Lew Hahn, general manager of the association, stated that although most of the retailers had suggested this topic before the convention, none was willing to prepare a paper on it or lead the discussion.

Hence the first day's meetings were largely occupied with discussing relations between retailers and con-

(Concluded on Page 2, Column 1)

New Crosley Model Has Large Capacity For Farm and Store

CINCINNATI—Specially designed for families requiring large food storage capacity, and particularly intended for use on farms and in rural communities, a new 6-cu. ft. electric refrigerator, priced at $99.95, installed, has been announced by Crosley Radio Corp.

Also for use in summer resorts, retail food stores, restaurants, and hotels, the new refrigerator is listed as the Crosley RFD Special Shelvador. Strictly a utility refrigerator,

(Concluded on Page 16, Column 2)

Refrigeration Engineers At Their Spring Meeting

Upper Center: E. C. Raney of Ranco, Inc. informally demonstrates the experimental thermostatic heat control on his Nash air-conditioned car

Business sessions, play, and conversational interludes were the order of the day when the American Society of Refrigerating Engineers met last week in State College, Pa. for its annual Mid-Year meeting. A Food Preservation Conference was also held during the week with the society cooperating.

(1) J. G. Bergdoll of York Ice Machinery Corp. and W. A. Wadsworth, St. Paul, Minn. engineer, await their turn on the golf course just across the road from the Nittany Lion Inn.

(2) E. R. Fitzgerald of General Electric Co.; R. H. Money, Crosley Radio Corp. chief refrigeration engineer; and D. P. Heath, Detroit Air Meter Co., talk things over after one of the sessions.

(3) Art Schellenberg of Alco Valve Co., E. C. Raney (in the car) and A. C. Homeyer, both of Ranco, Inc. Mr. Raney has his Nash air-conditioned car equipped with an experimental thermostatically controlled valve which regulates the hot water flow of the car heater so as to maintain a constant winter temperature of 72°. Perhaps all Nash cars will be so equipped next year.

(4) J. A. Vassar of the refrigeration department of Westinghouse Electric & Mfg. Co. looks over one of the papers presented at the food conference, in the company of Prof. Hugh Keeler of the University of Michigan.

(5) On the piazza of the Nittany Lion Inn. In this picture are Russ Ayers (with cigar), chief engineer of the Stewart-Warner refrigeration division; E. R. Fitzgerald (with paper) of General Electric Co.; R. E. King (standing) of General Electric; and W. M. Timmerman (with chair tilted back and whose face barely shows in the picture), head of the commercial refrigeration engineering department of General Electric. (Credit to Dan Wile of Savage Arms Corp. for taking the pictures on this page but we cannot identify the man in the far center chair or the one in the lower left-hand corner.) (For other convention pictures, see pages 2, 6, and 9.)

Scientific Study of Food Preservation Points to Expanded Market for Refrigeration Equipment

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(1) Pennsylvania State College is in the beautiful Nittany Valley and has a gorgeous setting but it is well-nigh inaccessible, at least it seems so to busy executives who expect to reach their conventions by an overnight ride on an air-conditioned Pullman. Smart members of the A.S.R.E. came by auto and thus avoided a couple of train changes and a bus ride. Here (left to right) are Dan Wile of the Refrigeration Division of Savage Arms Corp.; Gustave Petersen, advertising manager of *Refrigerating Engineering* (monthly publication of the society); Dick Townsend, eastern representative of Detroit Lubricator Co.; and Helen Peffer, managing editor of *Refrigerating Engineering*.

(2) The engineers found much to complain about at the meeting (including the absence of facilities for "the more abundant life" in the college dormitory, the long walk to the meeting hall, and the fact that the town was "dry"), but they all enjoyed the shady lawn of the Nittany Lion Inn. In this picture Phil Redeker, managing editor of the NEWS (left), hears about recent progress of the Z-Pack system of producing frozen foods from Van Rensselaer H. Greene, consulting engineer of New York City (he was president of the A.S.R.E. back in 1927). V. C. Kylberg (right), another old-timer in refrigeration (as time goes in this business) is also much interested in frozen food developments.

(3) Lee C. Leslie of Johns-Manville Co. (left); H. C. Guild of Vilter Mfg. Co.; and F. M. Cockrell, publisher of the NEWS. Mr. Guild and Mr. Cockrell are members of the Board of Directors of the society.

(4) The weather was so perfect and the setting under the great trees on the Inn lawn was so inviting that many of the committee meetings moved outdoors. This committee, deep in a problem which would appear to be rather important, is nevertheless getting the maximum enjoyment out of the climate.

(5) Edward J. McCall of Consolidated Gas & Electric Co.; Harry Klingler of Trenton Auto Radiator Works; C. R. Logan (until recently with York Ice Machinery Corp.) and M. K. Jasperson of Automatic Products Co., Milwaukee.

(6) Where the next Mid-Year convention should be held was a matter that brought forth considerable discussion. Here Managing Editor Redeker lends an ear as some veteran members of the society express their opinions. Left to right are Hal McPherson of Electrimatic Corp.; Phil Redeker; R. J. Quinn, Mathieson Alkali Co.; Otto Klopsch, chief engineer, Wolverine Tube Co.; and D. P. Heath, Detroit Air Meter Co.

(7) Two members who have contributed much to the society, and to the progress of the industry. (Left) E. W. McGovern of R. & H. Chemicals Department, E. I. du Pont de Nemours & Co., Inc., who has done and reported much research work on methyl chloride and its use in refrigerating systems; (right) Chester Lichtenberg of the General Electric Co., ardent worker for industry standards.

(8) Authorities on heat transfer Israel Kramer (his father and grandfather were coppersmiths and he has two brothers who are expert metal workers) and Harry Klingler of Trenton Auto Radiator Works confer with Art Schellenberg of Alco Valve.

(9) Experts on gases. A. H. Eustis, head of the Virginia Smelting Co., Boston, Mass., maker of refrigerants, and Prof. A. W. Ewell of Worcester Polytechnic Institute, Worcester, Mass., whose studies on ozone are well known.

Consumer Viewpoint Gets Dept. Stores' Attention

(Concluded from Page 1, Column 5)

sumers, with an eye toward the new consumer organizations which are now so much in evidence.

Consensus of the discussion seems to be that information is the key to better consumer relations. Retailers believe that manufacturers must take mystery out of their products, and tell exactly what's in them. For their part, retailers should educate buyers in how to use these products, and how to care for them.

Such bread cast upon the waters should return, they believe, in reduction of returns and repossesions.

One of the more startling statements made before the convention was that of Malcolm P. McNair, professor of marketing, Harvard university, who said: "Business should play ball with the New Deal in order to hasten it's departure.

"The present business situation is highly precarious. A cautious sort of wait-and-see attitude on the part of business will inevitably make the situation worse. There is only one road open to business, and that is a confident, full reassertion of private initiative.

"Business must have sufficient understanding and foresight to recognize the dangers of inaction and to perceive the necessity of going ahead in spite of current obstacles."

It was Prof. McNair's contention that unless idle capital and overcautious management get back into the game, government will be forced to take over more and more of the functions of private initiative.

Topics to be discussed tomorrow in the session of the merchandising division include the following pertinent questions of appliance selling procedure:

1. Advertising last year's models. Cut-price advertising on last year's models under impression that it is the current model.

2. Advertising price on the smaller model, but featuring a larger model.

3. Lack of standards for descriptive terms used in advertising.

4. Premium type of advertising—obsolete list prices quoted in comparative price advertisements.

5. Advertising shelf space instead of cubic foot content of refrigerators; sheet capacity for washing machines, etc.

6. Clarification of warranties—not a complete over-all guarantee; and guarantee should be in sticker form.

7. Bonuses that lead to high-pressure salesmanship.

8. Discounts to special customers for quantity purchases, etc.

'Free Cooking' Theme Is Planned By Standard

(Concluded from Page 1, Column 4)

to command the attention of range prospects and lead them to ask for an explanation of the term.

Through these inquiries, consumer interest in electric ranges generally will be multiplied and, as a result, the sale of such ranges, together with that of other household electrical appliances, should be materially increased, the company reasons.

Aim of the campaign is threefold: (1) to place electric cooking in a large number of homes; (2) to thereby build revenue for the electrical utility and thus making possible improved electric service at lower cost; (3) to create more sales and profits for distributor, dealer, and manufacturer.

"Progress of the industry in the sale of electric ranges in the light of competition from other forms of cooking has been phenomenal," Mr. Laidley stated. "The use of electric ranges and their acceptance by the general public has placed them in the 'accepted' class.

"However, the erroneous belief that electric cooking is too expensive, and the need for greater facilities and resourcefulness in manufacturing and distribution, have been two factors standing in the way of further progress in this field.

"To help remove these obstacles and to promote development of the vast sales potentialities which the market offers, we are launching our 'Free Cooking' campaign.

"Not only is our sales and executive force being expanded to handle the increasing sales which are anticipated in our own line," Mr. Laidley continued, "but our merchandising efforts are likewise being extended to support this expected sales progress."

MASTERCRAFT
ADJUSTABLE PAD AND CARRYING HARNESS
The most efficient and economical equipment made for handling refrigerators safely and without scratching or marring. Pad is separate from harness and both adjustable to all styles and sizes of cabinets. Efficient, sturdy, easily and quickly applied. Name of refrigerator attractively lettered on pad without charge.

Adjustable Pad, $9.50 each
Adjustable Harness $6.00 each f.o.b. Chicago.
Write for 1938 fulder and prices on pads for refrigerators, washers, ironers, ranges, radios, etc.
Pat. Appl'd for
BEARSE MANUFACTURING CO.
3815-3825 Cortland Street, Chicago, Illinois

Reflects Quality
ANSUL
SULPHUR DIOXIDE
METHYL CHLORIDE
ANSUL CHEMICAL COMPANY — MARINETTE, WISCONSIN

SERVEL
COMMERCIAL REFRIGERATION AND AIR CONDITIONING
Whether you need 6 machines or 6,000, Servel's engineers and factory staff will give you prompt, expert service. Write for details to Servel, Inc., Electric Refrigeration and Air Conditioning Division, Evansville, Indiana

PAR CONDENSING UNITS
28 MODELS
1-4 TO 20 H. P.
WRITE FOR FREE CATALOG
MODERN EQUIPMENT CORP.
DEFIANCE, OHIO, U. S. A.

BUNDY TUBING
Copper-Brazed Steel. Copper Coated Inside and Out. Sizes: ⅛" to ⅝" O.D.
BUNDY TUBING CO., DETROIT

Conditioning Helps Most Office Employes Work Better, ASHVE Survey Shows

(Concluded from Page 1, Column 4)

Ventilating Engineers, and conducted by F. C. Houghten, A. B. Newton, R. W. Qualley, and Edw. Witkowski, were reported to the ASHVE's semi-annual convention here last week.

A copy of the questionnaire, which was given to employes on Sept. 15 and collected on Sept. 16, follows:

"(1) What difference, if any, have you noticed in your reactions after leaving the office on warm days as compared to the period previous to the installation of air conditioning.

"(2) What difference have you noticed in your reactions and reactions of friends or associates who were not in conditioned offices during the day?

"(3) General remarks on the effectiveness of air conditioning."

According to the committee's report, the immediate reactions upon leaving the air-conditioned space were divided into four divisions and subdivisions. These were:

"(1) Felt too warm for a short period after leaving.

(a) Less than 20 minutes.

(b) Less than one hour.

(c) Few hours.

"(2) Felt too warm all night.

"(3) Felt indifference to warmth after leaving.

"(4) No intelligent answer."

Out of 274 questionnaires there were 243 answers to this question. They show that 35% generally felt too warm for a period of from less than 20 minutes to two hours after leaving the cooled space and that approximately 13% felt too warm throughout the entire night. Another 35% indicated that, in general, they had no noticeable reactions.

SOME TYPICAL REPLIES

A number of typical replies, without respect to the percentages, are quoted:

"Was acutely aware of the high temperature immediately upon leaving the building.

"A feeling of being quite warm for approximately one-half hour, with normal reactions thereafter.

"I noticed very little difference. It seemed slightly warmer at first, but after being out an hour or so everything was okey.

"The sensation of fatigue upon leaving the office has been less noticeable since the installation of air conditioning.

"That tired, worn-out feeling on hot summer days is eliminated and I think it enables one to accomplish much more work and still feel comfortable.

"The evening heat is less noticeable, because my system has not been under the pressure of heat during the warmer hours of the day."

"The next question which concerned 'reactions as compared with those who did not spend the day in air-conditioned space' were divided into three divisions and sub-divisions:

REACTIONS COMPARED

"(1) Stood hot weather better than if had not spent days in cooled space or than friends who had not spent days in cooled space .... 72%.

(a) Less complaint of heat .... 70.8%.

(b) Less fatigued, less tired, or had more pep ..... 1.2%.

"(2) Did not stand hot weather as well as if had not spent days in cooled space. Friends, who had not spent days in cooled space, stood heat better ..... 13%.

"(3) No difference in way they withstood hot nights compared to like feeling when days were not spent in cooled space, or when compared with feelings of friends who did not spend days in cooled space ..... 15%."

A few characteristic answers which may be of interest are given:

"In general, I was more comfortable, and usually was not quite as tired as a person working in a non-air-conditioned office.

"Most people complained about being all tired out and weakened by the heat, but I have never had such reactions.

"I noticed their apparent consciousness of the heat during the day, whereas, I had not been aware that the day had been uncomfortably warm.

"The heat affected them more than it did me. They had made themselves warmer by fretting about the severe heat."

Replies under the heading of Item 3, general remarks on the effectiveness of air conditioning, indicated a logical division into three divisions and sub-divisions, with per cent of reactions:

"(1) General reaction to air conditioning good, 66%.

(a) More comfort and pleasantness, 34%.

(b) Better efficiency, 27%.

(c) Free from colds, —1%.

(d) Better feeling or more pep, 4%.

"(2) General reactions to air conditioning not good, 32%.

(a) At times, too cool or drafty, 19%.

(b) At times, too warm, 4%.

(c) At times, stuffy, 3%.

(d) At times, too humid, 3%.

(e) Contracted colds or other derangement, including rheumatism or body pains, 3%."

A few characteristic replies to this question are given:

"It is a great help to non-smokers who must work between inveterate smokers all day.

"I have noticed that the office has been rather drafty at times.

"My own personal opinion of the effectiveness is that it at least keeps you comfortable one third of each day and it most certainly is great relief from hot spells in the weather which last weeks at a time.

"Easier to work when office is air conditioned during summer. Would be better if it could be the same in temperature every day.

"More work accomplished during the day than previously and with less fatigue."

"In general, the answers to the three questions presented in the questionnaire show a considerable percentage of general satisfaction in the experiences resulting from air conditioning," the report states. "Better than 35% were frank in stating that they felt too warm for a while after leaving the air-conditioned space.

"However, the duration of the hot reaction was in most cases not great, and no great importance was placed on it. An equal percentage showed an entire indifference to or a lack of this hot reaction.

DISCUSSION OF RESULTS

"Only approximately 13% of the total indicated that their evening and night reactions to the heat may have been increased due to their experience with air conditioning during the day. Undoubtedly, a considerable portion of these lacked satisfactory background on which to base their interpretations.

"In other words, at least 75% of all inquiries, and a larger percentage of those giving intelligible answers, had no overwhelming or serious reaction upon leaving the conditioned space.

"Again, a little over 70% indicated clearly that their unpleasant reactions to the hot nights or unpleasant reactions to a spell of hot weather were lessened by spending the working part of the day in the summer cooled and air-conditioned space.

"When 15% of those who were indifferent to the heat of the night are added to these, less than 13% are found who had a definitely unsatisfactory reaction to the hot evenings and nights, which was charged to air conditioning.

Sixty-six per cent in one way or another indicated definite positive reaction. These reported better feeling, more pep, greater efficiency, greater comfort, and pleasure due to spending the working hours or hot portion of the day in air-conditioned offices.

"While it is true that almost 32% stated some objection, these objections were usually limited to certain times, and should not, therefore, be definitely interpreted as a general objection to the satisfaction of air conditioning. They should be accepted rather as objections to occasional lack of perfection which may have actually existed at times in some parts of the extended office space.

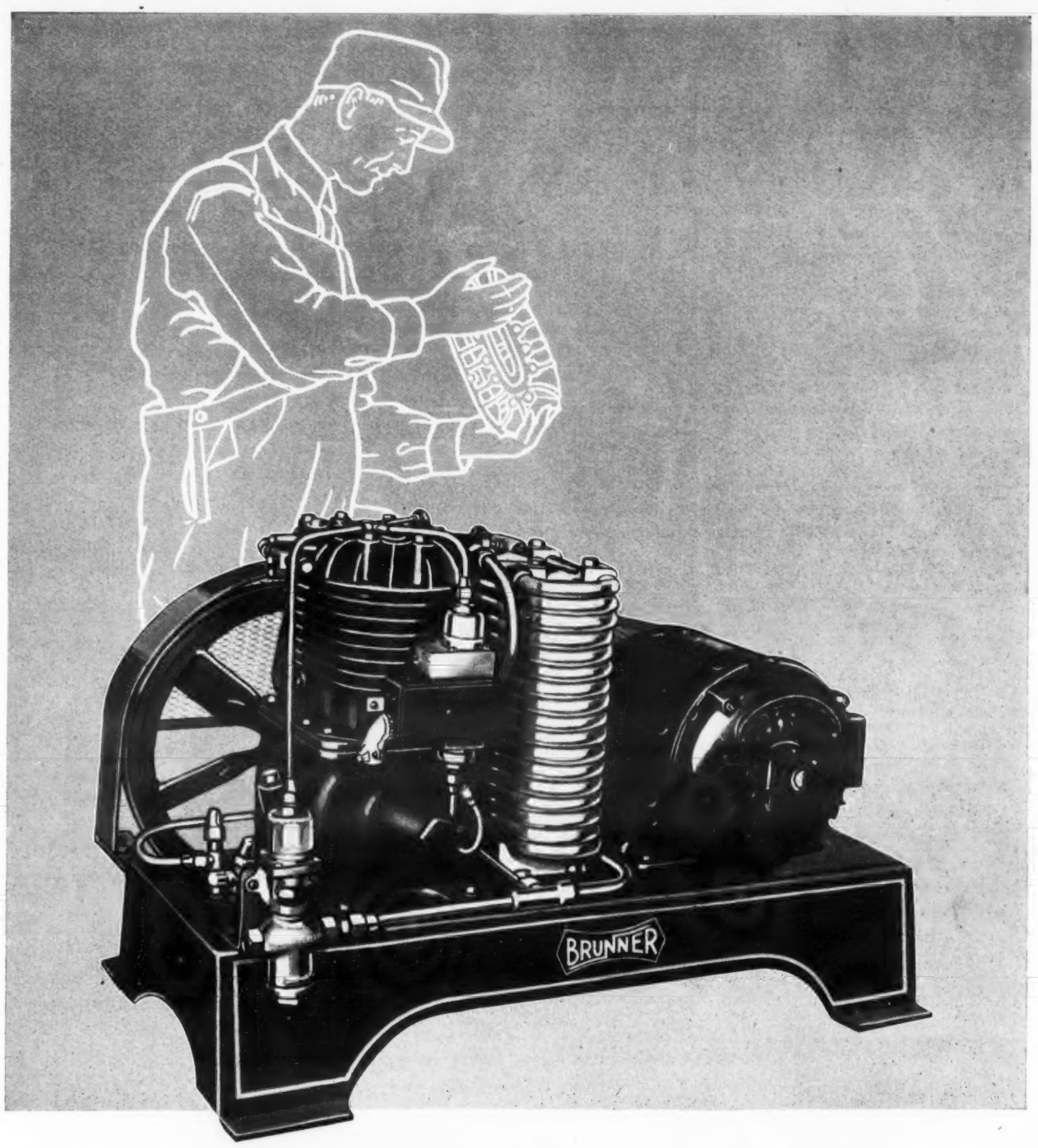
"It is well recognized that a person can spend a few hours during the day in a very warm atmosphere without any extended effect. In other words, recovery from short exposure to high temperature is rapid and more or less complete. On the other hand, exposure to hot atmospheres during a hot spell in the summer when one is unable to avoid the heat either night or day is severe and accumulative.

"The answers to these questionnaires go a long way to satisfy this contention. The questionnaire offers a little data on the contention that a high percentage of cold infections results from exposure to low temperatures maintained in air conditioning. Approximately 1% indicated a greater freedom from colds, while approximately 3% indicated a greater incidence to colds.

"Since it is generally well recognized that summer colds are usually due to infections rather than exposure, it is probable that the few replies received in this connection are of little importance.

"The one reply, listed in the sample replies to Question No. 3, charging the feelings of pains in joints and muscles, or rheumatism, to air conditioning is probably another case of the exception which proves the rule. It is probable that in any such extensive group of workers one or two could be found who had recently contracted some form of rheumatism, lumbago, or other source of muscular or joint pains.

"Similar studies to those carried on in Minneapolis during 1937 are being planned for other sections of the country during the summer of 1938. The importance of this type of analysis of occupancy in air-conditioned space is just being recognized and should be made an important part of future investigations."



BRUNNER CASTINGS THROUGHOUT ARE ACTUALLY *HEAVIER*...FOR ADDED

RUGGEDNESS

It's just common-sense engineering to add a "factor of safety" wherever performance is a vital consideration. But it is seldom you find commercial designs protected by so large a margin as you find in Brunner equipment. "Overprecautious," you might term Brunner engineering. Yet, experience has proved its value. Brunner castings, for example, are unusually heavy, far exceeding ordinary performance requirements. This is especially true of the super-duty castings of the compressor. Thanks to this rugged *difference*, Brunner Refrigerating and Air Conditioning units give a good many extra years of trouble-free service . . . Air and water-cooled models ranging from ¼ to 15 horsepower . . . Better get the whole story at once. Brunner Manufacturing Company, Utica, N. Y., U. S. A.

IT'S BRUNNER FOR *economical* SERVICE

Locker Storages

Figures on Costs and Income From a Small Town Locker Plant

DETROIT — Refrigerated locker storage plants will become an integral part of American economic life, because they contribute to the comfort, savings, and better living conditions of the people, asserted John L. Hoppe, publisher of "Meat Merchandising" magazine, speaking before a recent meeting of the Detroit section, American Society of Refrigerating Engineers here.

Pointing out that locker plants are a step up from the salt-brine barrel and smoke house methods of preserving meat widely used in rural communities, Mr. Hoppe feels that the best market for lockers will be in farming areas.

"When a farmer can save $33 on a 700-lb. head of cattle, over prices he would normally pay by selling the meat to a packer and buying it back at retail, the proposition must be economically sound," Mr. Hoppe said.

"There are 3,000 locker plants in the country today, and our estimate is that there will be 5,000 before the end of the current year. No phase of refrigeration has ever spread across the country with the same speed as locker storage refrigeration.

BETTER IN DAIRY AREAS

"Locker storage plants in the grain and corn areas, where farmers are scattered, have not done well. The plants go much better in the dairy sections, where farm communities are heavily populated.

"City people are spoiled, so far as meat consumption is concerned. When they rent a refrigerated locker, they eat up all the steaks, chops, and choice cuts first, and do not want the brisket, flank, and rump.

"Many of the 'bugs' in the earlier plants have been corrected," Mr. Hoppe stated. "Originally plants were put in without a sharp-freeze room, and a great deal of meat spoiled. In addition, meat was wrapped in a cheap southern pine paper which deteriorated immediately and tainted the meat. In these cases responsibility for spoilage rested with the locker operator and caused him many headaches. In the locker storage plant today, most rental contracts place responsibility for loss with the owner of the meat and not with the operator of the plant.

"The best combination for the selling of locker storage plants is a concern which can figure and sell all parts of the system. This includes the lockers themselves, refrigeration, and insulation."

Mr. Hoppe visited many locker plants in Iowa when they were first opened, returning to some of them after they had been in operation for six months. Owners and customers were better satisfied after the plants had been in operation for a period of time than they were when the plants opened, he reported; this, he believes, indicates that locker storage plants will prosper.

HOOK-UP WITH BUTCHER

According to Mr. Hoppe, the most successful locker storage plants have been set up in connection with retail meat establishments. These plants not only furnish an additional source of income for the meat retailer, but also draw additional customers to his place of business.

An excellent example of this type of operation is found in the experience of Ralph L. Schaller, Ashton, Ill., who converted a bank building into a meat market, and installed a profitable locker storage plant in the building next door, Mr. Hoppe said.

Mr. Schaller purchased the two-story bank building, complete with a poured cement vault, cashier's grill and all, for $3,000. He converted the vault into an excellent walk-in cooler, by substituting cooler doors for the heavy vault doors. The lobby of the bank was converted into an attractive meat display room.

Replacing the old "cracker-box and stove" of general store days, the room once used for safety deposit business was converted into an attractive rest room, with a davenport, easy chairs, and radio. This makes a comfortable place for townspeople to meet and talk over the affairs of the day.

The sub-vault, located in the basement of the building was made into a smoke-house, where Mr. Schaller cures hams, bacon, and other smoked meats. In addition there are facilities for making sausage, summer sausage, and hamburger.

When the remodeled bank building began doing a profitable business, Mr. Schaller visited other retail meat establishments in neighboring towns, and discovered that many retailers were putting in locker storage plants. This was in December of last year.

BUILDING RENT—$20

By Feb. 15 of this year, Mr. Schaller had a locker storage plant running in the store building next door, which he rented at a cost of $20 per month.

One hundred and fifty lockers are now installed in the building, which has room for 265. All lockers rent for $10 per year, but present plans are to ask $12.50 for drawer lockers next year.

Complete cost of the locker storage plant represents an investment of $5,602.59. Since this plant is fairly representative of the cost of a locker storage operation in connection with a retail meat establishment, the detailed costs are set forth as follows:

Mechanical Equipment		
Refrigeration equipment	$2,317.63	
Plumbing	7.77	
		$2,325.40
Rooms		
Cork and insulation	$1,459.12	
Lumber	323.30	
Painting (including labor)	46.85	
Cementing floor	90.81	
Labor (carpenter and installing cork)	150.45	
		$2,070.53
Cutting two doorways	$28.40	
Carpenter	10.12	
Lumber	15.60	
		$54.12
Processing Room		
Labor	$22.35	
Lumber	11.27	
Painting	2.00	
Rubber matting	3.93	
		$39.55
Locker Room		
150 lockers	$695.25	
Labor	19.40	
		$714.65
Chill Room		
Tracking	$49.44	
Lumber	7.26	
Labor	35.60	
		$92.30
Miscellaneous Expense		
Wiring	$181.53	
Publicity	25.00	
Rubber stamps	10.21	
Block and work table	48.22	
Bookkeeping outfit	16.97	
Metal trays	15.50	
Padlocks	3.86	
Tags	4.75	
		$306.04

According to Mr. Schaller, 30 new customers have come into his market to buy meat since the locker plant was opened in February. These people first came to inspect the lockers, and after becoming locker renters began to patronize the market.

18% OF MEAT BOUGHT

Of the meat stored in the lockers, 18% is purchased directly from Mr. Schaller, who puts on a brokerage charge of 3 cents per lb. No slaughtering is done for customers at the present time, but Mr. Schaller takes care of the processing and his wife handles wrapping. In rush periods it is necessary to have an additional meat cutter.

Mr. Schaller recommends that every locker storage plant operator keep an accurate set of books in order to determine the actual status of the business at all times. After paying the salary of his wife, and his own salary for the work done in connection with the locker storage plant, Mr. Schaller estimates that the plant will pay for itself in five years.

Operating costs of the plant include a water bill of $6.50 per month, and a power bill which totals $31.50. The electric power bills include the operation of lights, and a time clock arrangement that opens the doors of the locker storage room at 6 a.m. and closes the doors at 10 p.m.

Because of the fact that any hold-up man would undoubtedly lock the owner in the chill room, Mr. Schaller has installed a push button in this room which rings a large burglar alarm on the outside of the building.

Equipment used in the Schaller plant consists of a two-cylinder 4 x 4 ammonia compressor, equipped with a shell-and-tube condenser, 9 ft. x 16 inches; an oil separator; a 7½-hp. 220-volt, 60-cycle, three-phase motor, with automatic overload switch; and 700 feet of 1¼-inch coils.

Control equipment includes a thermal feed valve on each room, ammonia stop valve on each room, thermostat on each room, and a high-pressure cut-out, water regulating valve, and low-pressure cut-out switch on the compressor.

Mr. Schaller believes that locker storage plants are a "natural" for the rural meat market, Mr. Hoppe said, because of the additional retail business they bring the market, and that they may become a salvation for the rural meat dealer.

Farmers take a great deal of pride in having lockers, Mr. Schaller asserts, and will drive many miles in their automobiles to save money at the locker storage plant.

Operating costs for another locker storage plant, owned by E. L. Fedderson at Lytton, Iowa, include: power, $27.50 per month; water, $2.50 per month; insurance, $44 per year; laundry, $3 a month; state license, $25 a year; taxes, $35 a year; payroll, $25 per week; office expense, $1 per month; rent, $10 per month; wrapping, $12 per month; and depreciation 5% per year.

The Fedderson plant has 160 lockers and was built at a cost of $4,750. Locker rentals for the year amount to $1,616.

Geiger Says Locker Plant Success Often Depends on Ability of Custom Butcher

STATE COLLEGE, Pa.—"If any one thing may be deemed responsible for the rapid spread and development of locker systems, it was the establishment of a custom butcher," declared A. A. Geiger of York Ice Machinery Corp. in speaking on "Refrigerated Locker Plants" before the Food Preservation Conference held here last week.

"The butcher has much to do with the success or mediocrity of a plant," Mr. Geiger elaborated, "for it is he who must meet the patrons, serve them, and keep them satisfied.

"He is responsible for the sanitation of the whole plant and allows nothing to be placed in the lockers except what he himself puts there; in this way, everything that goes into the lockers is properly chilled, wrapped, and frozen."

It did not take long for the urban housewife to discover that she, too, could use a refrigerated locker and save money on her food bills, Mr. Geiger stated in explaining the growing popularity of locker plants with urban customers.

"In the beginning, before the advent of the custom butcher, she had to get her meat supply for her locker from a farmer friend or relative; but now she may get it at the locker plant from the custom butcher who will purchase it for her from farmer or packer if she wishes this service," he declared.

"There is another service now offered in many of the plants; many plant owners are purchasing in wholesale lots frozen fruits, vegetables, and fish and are selling them in mixed quantities of 10 lbs. or more to their locker patrons. This permits an opportunity to save on items other than meats, and is greatly appreciated."

While United States government statistics show that the annual consumption of meat per capita is about 166 lbs., Mr. Geiger declared that it can be safely assumed that locker users will consume more and that the annual consumption may be figured around 200 lbs.; therefore the average family of four will use about 800 lbs. of meat per year.

"It is estimated that the average saving per pound of meat put in lockers by a city dweller compared to the price paid by him at a retail market is about 10 cents," said Mr. Geiger.

"Based on these figures, the urban family of four saves $80 annually on their meat bills alone if they are locker users. The saving to a farm family is even greater, for the farmer has his meat at production cost.

"To a community of 500 locker users, this means an annual saving of $40,000. In the state of Iowa, where it is reported there are around 250 locker plants serving at least 75,000 families, this means a saving of $6,000,000 annually.

"The refrigerated locker system, as we see it, is the nucleus of a new method of merchandising frozen food products at a cost whereby a large majority of families can afford to use it, and is playing a major part in educating the public to the value and advantages of frozen products."

Seek WPA Funds For Meat-Curing Plant At Raymond, Miss.

JACKSON, Miss. — The Hinds county board of supervisors is seeking WPA labor for construction of a $40,000 meat curing and refrigeration plant on the campus of the junior college at Raymond. Plans for the project, completed here last week, call for purchase of necessary material and equipment amounting to approximately $18,000 by the county, with the labor cost to be met by the government.

The project was advocated before the county board of supervisors by County Agent John R. Williams, who called attention to a similar plant successfully operated at Brandon.

"I know of nothing needed in Hinds county more than a meat curing plant," said Mr. Watkins. "For every car of hogs shipped out of the county, a train load of cured meat is shipped in."

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Air Conditioning

Growing Importance of 'Little' Jobs Makes It Easier For Small Dealer To Get Into Air-Conditioning Field

Mac Smith is a Detroit merchandising counselor who has been making an intensive study of trends in the merchandising of air-conditioning equipment. He has studied the reports on air-conditioning installations made by utility companies in metropolitan centers, and he has also had access to the results of an extensive study made among prospects for air-conditioning equipment.

In this and subsequent articles in AIR CONDITIONING & REFRIGERATION NEWS Mr. Smith will point out some of the trends in the sale of air conditioning indicated from the sales records and surveys which he has studied.

By Mac Smith, Detroit Merchandising Counselor

AIR conditioning as a business has been fast changing complexion. The "little" jobs are taking on bigger importance in the national sales picture, as shown by a survey of 1,366 recent air-conditioning installations in Springfield, Brooklyn, Syracuse, Indianapolis, Chicago, Miami, San Antonio, Houston, and Fresno.

Stores and shops—predominately one-room establishments like dress shops, shoe stores, haberdasheries, men's wear shops, and drug and confectionery stores — represented only 10% of the tonnage in these communities prior to 1935. Two years ago they jumped to 25%. Last year they accounted for a third of all air-conditioning business.

Restaurants were believed by many to be a saturated market when they reached 12% of the air-conditioning tonnage in 1935. But they were up to 14% last year.

OFFICE JOBS SHOW GAIN

Individual offices and suites, which dropped off more than half in 1935, are back to 9%. And the tap rooms, dining rooms, and lounges in hotels come next in importance according to latest comprehensive figures on air-conditioning installations.

Contrast this picture with the big-tonnage activity. Theater installations, which accounted for 40% of the tonnage just a few years ago, now are well under 7%. And big buildings and industrial plants, still a very active field for the man who can handle all kinds of air conditioning, are dropping in relative importance because the up-and-coming market for smaller, simpler systems is growing so much faster.

This situation presents a most encouraging outlook for the air-conditioning business as a whole. Encouraging because it means that air conditioning is getting established in the mass market.

There may be only 16,000 operating moving picture theaters in the country, and the best part of them already are air conditioned. But there are 40,000 dry goods and variety stores alone, 60,000 drug stores, 64,000 barber and beauty shops, 20,000 shoe stores, and 126,000 good restaurants, just as an example of the small tonnage market, and they've only begun to buy air conditioning.

CHANCE FOR SMALL DEALERS

As the small-tonnage market grows in importance, it becomes more profitable for the smaller dealer to establish himself in the air-conditioning business.

More outlets for air conditioning mean more sales. More sales mean bigger production schedules in air-conditioning factories, almost invariably resulting in lower prices for equipment. And reduced prices mean easier business for everybody!

From the standpoint of the dealers who are focusing their activities on small-tonnage business, we have been told by a number of them that it is the most desirable kind of business to handle, for the following reasons:

1. **Easiest to sell!**

The first man to approach an air-conditioning prospect stands a good chance of getting the business. There is not so much shopping around, not nearly as much competition on the ground as when a big job is up for consideration.

Very little red tape stands in the way of the salesman. The typical one-room retail establishment or restaurant has no "board of directors" to ponder over the proposition, no purchasing agent to send out for a flock of bids, no "hidden executive" who's going to make the final decision without giving the salesman a chance to state his case. The man who runs the business is the man who is going to do the buying. And almost anybody can get in to see him.

2. **Easiest to figure.**

The requirements of the typical "one-room job" are simple, standard equipment, right out of stock. Standard duct construction, if complete ceiling or floor-mounted units can't be used. No remote ante-rooms, no high vaulted ceilings, no unprotected skylights in the average job. Just a straight problem of cubage and occupancy which can be figured right on the spot so the price can be quoted on the first call.

CAN PLAN OWN LAYOUT

And, because the man who sells this kind of installation is usually the man who designs it, he gets a chance to lay it out the way he can install it most easily and economically.

3. Dealers say that they can handle this kind of business on much less overhead than if they were geared up for handling all kinds of air conditioning.

Very little organization expense is involved, because their air-conditioning activity is carried on as a sideline and doesn't add much to their fixed charges.

4. Not much engineering expense, because many of the jobs are so simple that the salesman can figure or estimate them right on the spot.

Little or nothing is needed for warehousing, because so much equipment can be drawn right out of manufacturers' stocks.

And sub-contracting has been cut to a minimum these days when there are so many kinds of "packaged" equipment that eliminate ductwork and the need for building alterations and redecorating.

Still another big factor in this fast-growing field plays into the hands of the "little fellow" in air conditioning. The typical sale is a local, man-to-man proposition.

The dealer who has the confidence of his prospect holds a big advantage. If he already has sold him refrigeration, or store fixtures, or water coolers, or lighting equipment, and earned a reputation for good service, he's months ahead of any big-time stranger when the matter of air conditioning comes up.

Dealers from all parts of the country report that big nationally known names often help to swing a sale, but the records show that more than half the tonnage is sold on the basis of local reputation alone.

However, the most important thing, the brightest spot in the picture from a merchandising man's standpoint, is the fact that the small-tonnage air-conditioning market is a virgin market, virtually unexplored.

The pioneering work on the minds of the prospects has been done. Everybody knows what air conditioning is. Everybody has enjoyed its benefits, in air-conditioned theaters, restaurants, and railway trains. There is less and less of the old conversation about its being unhealthful, dangerous, about that clammy feeling, and about its making people soft. People generally agree today that air conditioning is desirable.

But the sales work on the air-conditioning prospect has scarcely been started. A cross-section survey of the "Main Street" market across America, the little one-room stores, restaurants, beauty and barber shops, drug stores, and dress shops of the type to be found in any city and town in the country, revealed the amazing fact that 79% of those people who are seriously considering the purchase of air conditioning during 1938, have never had a sales contact from **any** representative of a manufacturer or dealer in air conditioning!

The fastest moving part of the air-conditioning business is sitting in the heat waiting for the first man who comes around to sell some air conditioning.

Jacobs Handles Yorkaire Units In Madison, Wis.

MADISON, Wis.—Jacobs Brothers Co., household appliance and lighting fixture firm at 342 State St., has been named dealer for Yorkaire portable air-conditioning units, manufactured by York Ice Machinery Corp.

Cooling Aids Court's Work, Halts Judge's Hay Fever

JEFFERSON CITY, Mo. — Missouri's supreme court frequently remains in session most of the summer, cleaning up back cases and preparing decisions for the fall term. And what's more, the chief justice has hay fever.

So to aid and abet the comfort of both the court and its chief justice, a Carrier air-conditioning system has been installed in the judicial chambers. It is estimated that this system cost each taxpayer only "one-thousandth of a cent."

Compressor and condenser of the system were placed in the rear of the court building's basement. Three Carrier Weathermakers were fitted in unused closets on the chamber floor, and air was supplied to the judges' rooms by means of ducts.

Omaha, Neb. Hotel Conditions Guest Rooms on 4 Floors

OMAHA, Neb.—Contract for air conditioning four floors of guest rooms in the Hill hotel here has been awarded to the Baker Ice Machine Co., according to Sam Josephson, owner.

Cooling of guest rooms will be an addition to the system installed last year which serves the lobby, two dining rooms, and four taverns in the building.

Binks Builds Cooling Tower Test Plant

CHICAGO—To aid in the improvement of the line of cooling towers which it produces, Binks Mfg. Co. has erected a complete new cooling tower test plant.

On the roof of this plant stands an atmospheric cooling tower which has been erected on a steel substructure designed to hold not only this tower, but also the forced draft and induced draft type of towers made by the Binks Co.

The various types and sizes of towers will be connected up to suitable circulating pumps for conducting tests comparable to actual operating conditions in the field.

Water is heated to any desired temperature by a system of cross-connected boilers. Adjacent to the test plant is an instrument panel which automatically records temperatures on and off the tower. Wind velocities, operating pressures, and all other essential data are also recorded.

First Air-Conditioned Bakery Job Contracted In Omaha

OMAHA, Neb.—York air-conditioning equipment will be installed in the P. F. Peterson Baking Co. here, according to Milton Peterson, vice president of the company. This is the first bakery here to be completely air conditioned. Cost of the installation will be approximately $10,000.

There have been more than three million Detroit Expansion Valves turned out since the unit on the left was built 8 years ago. Practically every year since then there has been some worth while improvement in valve design added to the Detroit line. This line today incorporates every improvement applicable in modern refrigeration practice.

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Especially hard alloy that resists corrosion and wear—assures tight shut-off and gives years of extra service life.

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Self-aligning needle construction eliminates wear due to side thrust and wiping action against the seat and prolongs service life of the valve.

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Tranquility of Penn State's Campus Provides Engineers With Conversational Opportunities

(1) In this group photographed at the doorway to the Nittany Lion Inn from left to right are L. S. Morse, executive engineer, York Ice Machinery Corp. (ex-president of A.S.R.E.); Dorothy Field, daughter of Crosby Field, A.S.R.E. president (Dorothy decided to enter Penn State next fall); C. T. Baker, Jr., son of the well-known Atlanta, Ga., consulting engineer; Margaret Field, another of Crosby Field's daughters (Margaret enters her senior year at William & Mary college this fall); Mrs. L. S. Morse; Mrs. J. G. Bergdoll; and J. G. Bergdoll, York Ice Machinery Corp.

(2) Lee C. Leslie, Johns-Manville Co.; C. R. Logan of Philadelphia (chairman of the A.S.R.E. Sections Committee); and Prof F. C. Stewart of Pennsylvania State College (chairman of the Convention Committee).

(3) H. C. Guild, Vilter Mfg. Co.; Mr. Logan; Mr. Morse; J. F. Stone, Johns-Manville Co.; and Mr. Leslie.

Commercial Refrigeration

N. Y. Fire Department Launches Drive Against Operating Display Units

(Concluded from Page 1, Column 2)

porary removal of some refrigerators from the sales floor.

All stores merchandising electric refrigerators will be visited by inspectors, the Fire Department announced, and the provision of the ordinance in question enforced uniformly. To avoid complications under the act, several stores in the past have been showing only "dead" refrigerators on their floors.

Long a controversial matter between retailers and the Fire Department, the matter of whether or not refrigerators need be kept in airtight rooms for operating displays has been the subject of several hearings in recent months. A new ordinance is under consideration, but no changes in present regulations have as yet been made.

Retailers and the Refrigerator Association of New York, in their objections to this section of the present ordinance, protest that household refrigerators do not contain the 6 lbs. of refrigerant specified in Section 220-1A of the act, and therefore should be except from this regulation. No concession to the request has been made by the board.

To avoid further difficulties pending exemption from provisions of the act or the passage of new legislation, most stores are believed willing to display "dead" units.

'Filterpure' Unit For Reach-In Models Marketed By Betz

HAMMOND, Ind.—A new "Filterpure" cooling unit, designed for installation inside reach-in refrigerator cabinets, and which is said to produce uniform low temperature, controlled humidity, and centrifugal blower circulation, has been introduced by Betz Corp.

In operation, the fan motor in the top of the unit forces air down through an activated carbon pad to eliminate odor and purify it, then over and around a cooling coil in the base, and out into the refrigerator interior.

Just above the coil is a heat interchanger with fittings for an expansion valve.

Filterpure cabinet has a baked Dulux finish with stainless steel ornamental strips, and comes in two styles—one for installation on the back wall of the refrigerator cabinet, the other for installation just behind the central partition. The unit is available to fit 20, 30, 45, 60, and 90-cu. ft. refrigerators.

New Frozen Foods Plant Finished In Hillsboro, Ore.

HILLSBORO, Ore.—A new frozen foods plant has been completed here by B. E. Maling & Co. In the season just closed, the company reports it has doubled its frozen crab pack, a total of 120,000 lbs. having been packed this year.

Seattle Ice Co. Triples Its Sharp-Freezing Facilities

SEATTLE—In preparation for the approaching berry and vegetable season, Seattle Ice Co. has tripled its sharp freeze facilities. A total of 1,000 tons will be handled this year.

Coil Arrangement Has Dual Purpose In New Ideal 'Speed' Cooler

ST. LOUIS—Ideal Beer Cooler Co., manufacturer of beverage and draft beer coolers, formerly located in East St. Louis, Ill., recently has moved to larger quarters at 1500 N. Broadway here, where it occupies three floors containing a total of 30,000 sq. ft. of floor space.

The company's draft beer cooler, formerly known as the "One Draw" beer coil, is made in four models, including from two to four beer coils and one water coil, and having hourly capacities ranging from 30 to 60 gallons of beer.

Features of the unit include a nested coil construction submerged in a "non-freezing" solution, the serpentined refrigerant tubing being designed to assure consistent efficiency, with no oil clogging. The unit, it is claimed, can be installed in any bar fixture, such as novelty box, tap stand, or floor cooler, with a minimum of installation labor.

The Ideal "Speed" beverage cooler has a coiling arrangement which divides the cooler into separate compartments, serving the double purpose of separating various brands of beverages and at the same time bringing all beverages closer to the evaporator, so that faster cooling results.

Beverage cooler is made in three lengths: the six-foot size has a capacity of 18 full cases of beverages; the seven-foot unit holds 21 cases; and the eight-foot model holds 24 cases. Twelve-ounce bottles are considered standard in giving bottle capacities.

The beverage cooler is 32 inches high, and 27 inches wide, and fits under any standard bar, it is said.

Canadian Farmers Seek Storage Plant Loan

YORK, Ont., Canada—The Dominion and Provincial governments will be asked by the York County Council for financial assistance in constructing a cold storage plant in Markham Village, to be operated by a cooperative association that would repay funds advanced by the governments on a long-term loan.

Patterned after plants at Simcoe, Aldershot, and Thornbury, the proposed unit would be used to store crops such as apples, tomatoes, and berries until such time as the market was favorable for shipping.

Fall-To-Spring Storage Plant Helps Farmer To Sell Apples At Better Prices

ASHLAND, Mass.—By maintaining a temperature of 33° F. with 85% relative humidity from September to March, an air-conditioning system in the storehouse of George Green, farmer here, has solved the problem of storing apples for the winter and also has enabled Mr. Green to get better prices on held-over crops.

A York 10-hp., self-contained ammonia compressor provides refrigeration for a conditioning unit installed in the storehouse. Air in the room is passed through the conditioner and recirculated by a 3-hp. fan with a capacity of 10,000 c.f.m. Outside air also is drawn in and mixed.

Coil heat is absorbed by water pumped to a cooling tower and then returned to the conditioner. Provision is made in the piping system for the intake of additional water.

Coils consist of 2,000 lineal feet of ¾-inch galvanized steel pipe, staggered 1½ inches apart on centers and without fins. This arrangement is said to prevent accumulation of frost and to check loss of air velocity.

The storehouse itself is 60 feet long, 40 feet wide, and 10 feet high. Walls are of 4-inch sheet cork and plaster, with a 2-inch floor of similar construction. Ceiling is of 8-inch granulated cork.

Mr. Green estimates that his increased profits from apples when the demand for high quality fruit is strong late in the season will pay for the installation in about 10 years.

Dr. Rentschler Answers Engineers' Queries On Use of 'Sterilamp' In Food Keeping

(Concluded from Page 1, Column 2)

at the convention. At the conclusion of his talk Dr. Rentschler was bombarded with questions from the attentive audience.

From the speaker's address and his answers to the questions the following was learned:

1. In Dr. Rentschler's own words, the Sterilamp "will not replace refrigeration in the preservation of foods, but should make it easier and more effective."

2. It is the ultra-violet radiation in the bactericidal region that has the lethal effect on bacteria or mold, and not the ozone that is a by-product of the ultra-violet radiation. Tests made in specially constructed tunnels where the effect of the two factors could be carefully controlled demonstrated this rather conclusively, Dr. Rentschler averred.

3. The ozone does have some bactericidal effect, however, and this is helpful in killing bacteria and preventing mold on the side of the product which may be shaded from the ultra-violet radiation. The amount of ozone produced, however, is not deleterious to food products, as far as can be determined, Dr. Rentschler claimed. (Ozone in high concentrations was said by one questioner to turn fats rancid.)

4. However, since ozone hasn't much bactericidal effect above 40° F., and the ultra-violet radiation works best at temperatures slightly higher than 40° F., there is a question as to whether a user could count on any added bactericidal effect from ozone produced by the lamp.

5. Air circulation is desirable in the use of the Sterilamp in conjunction with food preservation, since tests have indicated that only one-tenth the amount of radiation is needed to kill organisms floating in the air than is needed to kill organisms settled on a surface. This would help to take care of the "shade problem," also.

6. It is not efficient to blow air made sterile by the Sterilamp over food products to kill organisms. It can be done, but takes a much longer time than ultra-violet radiation on the product and the air surrounding it.

7. Generally speaking, there is no penetration of the radiation into the product, only surface cultures being affected, Dr. Rentschler said. However, in answer to a question from the floor, Dr. Rentschler declared that the ultra-violet radiation would be effective through a thin film, such as might be formed on the product from handling.

(*Editor's Note*: Dr. Rentschler's formal discussion of the Sterilamp as presented at the meeting will be published later.)

A. & P. Produce Co. To Sell Frozen Foods Cases

SAN FRANCISCO — A. & P. Produce Co., Inc., has been appointed representative in northern California and Nevada for "Zero-Air-Aitor" frozen foods cabinets, made by Universal Mfg. Co., Decatur, Ill.

The A. & P. company also is representative for Frostkraft Frosted Foods in the same territory.

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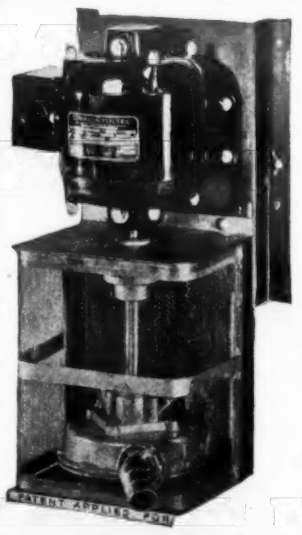

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50% FASTER COOLING

Easy to install in any wet type beverage cooler.

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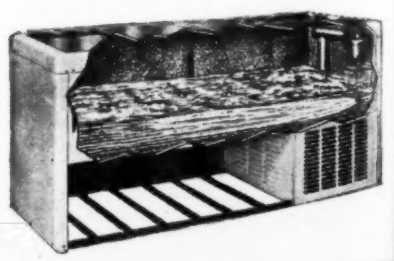


Specialty Selling Methods

Staff of San Antonio Dealership Analyzes Salesmen's Technique In 'Practice'

SAN ANTONIO, Tex.—Frequent "practice sales" in regular staff meetings, with one salesman acting as the prospect, another as the salesman in the case, and the rest of the men looking on as judges, have helped San Antonio Music Co. to increase sales of refrigerators by improving the salesmen's selling technique, Walter Meyer, sales supervisor, asserts.

Mr. Meyer also attributes much of the sales increase to an intensive sales campaign in which emphasis was put upon new selling angles, new experiences, new suggestions, and other new ways of injecting fresh interest and enthusiasm into both salesman and prospects.

In the test sales, the salesman "on trial" approaches the "prospect," demonstrates the refrigerator, presents his sales talk, and tries to close the order.

ALL TAKE NOTES

While he is doing all this, the other salesmen observe his procedure, take down notes on the good and bad points, and at the conclusion decide, by vote, whether or not the sale was successfully made.

"If it is determined that a sale was effected," said Mr. Meyer, "that salesman is given every opportunity to make good. We give him good prospects, we coach him in his work, and, on occasions, we will go with him to give every assistance in making him a successful salesman.

THEY 'SCORE' HIM

"If it is determined that a sale was not made, then the salesman is given special coaching on those selling points in which he was weak. In other words, we want to have it known that those men who study hard and put an honest effort behind their sales discussions will have all cooperation that we can give."

At the regular morning sales meetings of the staff, incidents and experiences of the preceding day are brought out and discussed so that, if helpful, they may be used to good advantage in the current day's work, Mr. Meyer explained.

SATISFIED USERS RESULT

"We discuss why some sales were concluded, while others failed," Mr. Meyer stated. "We analyze, dissect, break down, and do everything to determine what was lacking in the failures. This has resulted in a marked improvement among our salesmen's records, and has made a group of satisfied salesmen.

"It has given us a class of satisfied customers, thoroughly and completely sold on their refrigerators. This is one of our biggest assets, for it is estimated that a third of all new sales are brought to the store through the recommendation of satisfied customers."

RENEWS ENTHUSIASM

One of the most difficult problems confronting dealers, Mr. Meyer said, is that of renewing interest and the desire to sell after the first flush of enthusiasm has died down in the salesmen.

To create new eagerness in his salesmen, Mr. Meyer explained, he impresses upon them the fact that they can make more sales by learning the scores of live selling points in a refrigerator—features, uses, methods of using with which the prospect is unfamiliar.

He also shows them how the commonly known features can be used as good sales closers and arguments, and encourages them to stress these features in their sales presentations.

"The real essence of selling," declared Mr. Meyer, "rests in an analyzation of those features which make up the product, and none of these is too large or too small for consideration. Many times, the very feature which we may consider insignificant is the one which could swing the sale."

Westinghouse Distributor Auctions Refrigerator At Cooking School

DAYTON, Ohio—American Sales Co., Westinghouse distributor in this territory, has been cooperating with its dealers in holding "auction" cooking schools in several small towns hereabouts.

After the various demonstrations which comprise the cooking school are completed (Westinghouse appliances being used throughout, of course), the refrigerator used in the school is auctioned off to the highest bidder.

Promotions of this type already have been held in Bellefontaine, West Liberty, Troy, Piqua, Sidney, Urbana, and Versailles. Similar projects are being planned elsewhere.

Dale Carnegie Is Star Of Sound Slide-Films On G-E Radio Line

NEW YORK CITY—Three sound slide-films in natural color, featuring Dale Carnegie, author and speaker, and R. C. Borden of the Borden & Busse salesmanship team, are being shown at radio distributor and dealer meetings throughout the country by the radio division of General Electric Co.

Designed as sales training helps, the slide-films featuring Mr. Carnegie and Mr. Borden are general in nature. In his film, Mr. Carnegie relates several sales "success" stories.

Mr. Borden talks on the sales rule, "To demonstrate, don't demonstrate—let George do it," and shows the advantages of letting prospects handle the product themselves.

Third film shows the complete 1939 line of G-E radios, introduced by E. H. Vogel, radio sales manager.

New Lines Shown To Dealers By Shapiro

NEWBURGH, N. Y. — Shapiro Sporting Goods Co., newly appointed RCA-Victor distributor, recently held the most successful dealer showing in the company's history, according to Jack Weisman, advertising and sales promotion manager.

The 1939 line of RCA-Victor models was displayed in the showroom on the top floor of the Shapiro building, and was presented by Harold Gabrilove, manager of the company, Samuel Rosenblum, sales manager, and Mr. Weisman.

For Information on Motors
FOR ALL TYPES OF
Air Conditioning and
Refrigeration Equipment
WRITE TO
Wagner Electric Corporation
6441 PLYMOUTH AVE ST. LOUIS, MO.

Varied List of Prizes Spurs Narragansett Co. Salesmen To $8,000 Volume on 'Jinx' Day

PROVIDENCE, R. I.—Friday the thirteenth was anything but unlucky for Narragansett Electric Co.—for on Friday, May 13, that utility's appliance sales force engaged in the most successful one-day sales drive in the company's history to wind up with a record-smashing total of 56 appliance sales representing a dollar volume of approximately $8,100.

The total of 56 units included 34 refrigerators, 15 ranges, and seven water heaters.

SURPRISE CAMPAIGN

Bill Barstow, sales manager, sprang the campaign as a complete surprise to the entire sales force, with the exception of the three supervisors—Jack Cullen, Jack Barlow, and Doug Bonner. The day of the drive was named "Sweeney Day" in honor of Arthur A. Sweeney, assistant sales manager, and the campaign slogan was "Tell it to Sweeney!"

The drive opened at 7:30 on the morning of the thirteenth with a breakfast meeting at the Crown hotel. Before any announcement of the campaign was made, all orders for the previous day's business were collected so that everyone would have to start from scratch.

By noon, 12 orders had been reported; at 5 p.m. the total had reached 35; when the rally meeting opened at 10:30 p.m., the record 56 units had been sold. And this despite the fact that the most optimistic estimate for the day had been 50 sales.

60 SALES CLOSED

The grand total of 56 units was aided by four water heater sales made by Bill Dubois, the utility's water heater specialist, who was pulled from his desk and sent out into the field for the day. The orders which he brought in were credited to various salesmen and were counted among the total sales for the day.

In addition to some $500 in regular bonuses, the salesmen walked off with a varied assortment of prizes. Al Ciccone, already the utility's high man on refrigerator sales, won the prize for the first order turned in and also the prize for the greatest number of sales for the day. He reported his first order just 25 minutes after the breakfast meeting closed, and made a total of six sales during the day.

Results of the drive so far exceeded expectations that the original prize schedule had to be revised:

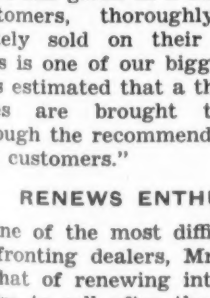
Panama hats were awarded to Dave Lyon, Sheldon Lyons, and Jack Mahoney, each of whom made four sales; sailor straws were won by Joe Brelsford, Chris Figliolini, Howard Grinnell, Ray Rossignol, and Walter Reardon for three sales apiece; and neckties were given to Bill Walsh, Harry Dawson, Arthur, Gledhill, Chet Madsen, Nelson Mellen, and Bill Smith, for two sales each.

Frozen Dessert Recipes Bartered For Prospects On Service Calls

HOLLYWOOD, Fla.—Recipes for frozen desserts are exchanged for prospects' names by A. N. Waite, in charge of service for Michel Paint & Electric Co., General Electric appliance dealer here.

Mr. Waite discovered that many customers were not getting the full benefit from their refrigerators because they didn't know how to prepare frozen desserts in them. Now on his service calls Mr. Waite presents the housewives with a recipe for ice cream prepared with evaporated milk, and in return the housewives give him leads which he can turn into sales.

You can sell more Copelands



because they're priced to sell!

Today's market is price-minded. Copeland's low price means "lower-down-payment and easier terms" and those are magic words! Get the facts about Copeland's extraordinary proposition. Write today!

Copeland Refrigeration Corporation
Sidney, Ohio

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Seeking Lower Temperatures

OUTSTANDING among the developments in refrigeration research reported at the annual midsummer convention of the American Society of Refrigerating Engineers last week at State College, Pa., was that in almost all branches of the art engineers are working with lower temperatures.

Take household refrigeration as a starter. It was pointed out that very few household models now on the market provide temperatures low enough to keep quick-frozen foods more than a few days at a time.

Revival of Quick Freezing Changes Household Standards

With the recent expansion of the quick-frozen foods industry, and the knowledge that the expansion will likely be multiplied many times in the very near future, engineers have gone to work on the problem of incorporating quick-frozen foods compartments—adequate for the keeping of such foods for weeks instead of days—into household refrigerators, and doing it economically.

This same development has again brought low temperatures to the attention of makers of display and storage cases, coils and compressors, for the commercial refrigeration trade.

Commercial Manufacturers Interested Again

At the first appearance of quick-freezing, nearly every factor in the refrigeration industry was experimenting with low-temperature equipment. But when quick-freezing was abandoned by all large-scale producers except Birdseye, and when that concern began taking all its equipment from one source and renting it out to retailers, the commercial refrigeration business lost interest.

Now, however, there are a number of producers in the field, and distribution is headed toward a nation-wide goal, instead of being limited to New England. So case and machine makers are again taking up the difficult problems which surround this branch of the business.

Locker Storage Needs Lower Temperatures

Locker storage, which has come on with such a rush, seems headed for lower temperatures, too. So new is this industry that adequate data is still not available on proper temperatures for various types of food freezing and storage. But several of the speakers on this subject at the convention made the point that lower temperatures are undoubtedly needed in this field.

This means, of course, more expensive initial equipment. It also means more efficient operation, and more profitable volume.

Even more important from the standpoint of the future of the refrigeration industry is the research now being carried on in industrial applications of low temperatures.

Control of Zeppelin Inflation Forecast

For example: In attempting to reach absolute zero, scientists have been working with the liquefaction of helium. One predicted result is the much more efficient control of lighter-than-air dirigibles, through the control of helium's volume, weight, and lifting powers by temperature.

As everybody knows, the progress of the zeppelin—which has so many theoretical points in its favor, especially in low-cost air transport of freight—has been checkmated time and again by historic and frightful disasters like that of the ill-fated Hindenburg.

The use of helium in place of hydrogen as an inflating agent assures safety from explosion; but other factors, such as ballast and control, have made helium-filled dirigibles somewhat unwieldy and unpredictable. Low-temperature work would seem to present solutions to these difficulties.

Progress In Refrigeration Science Just Starting

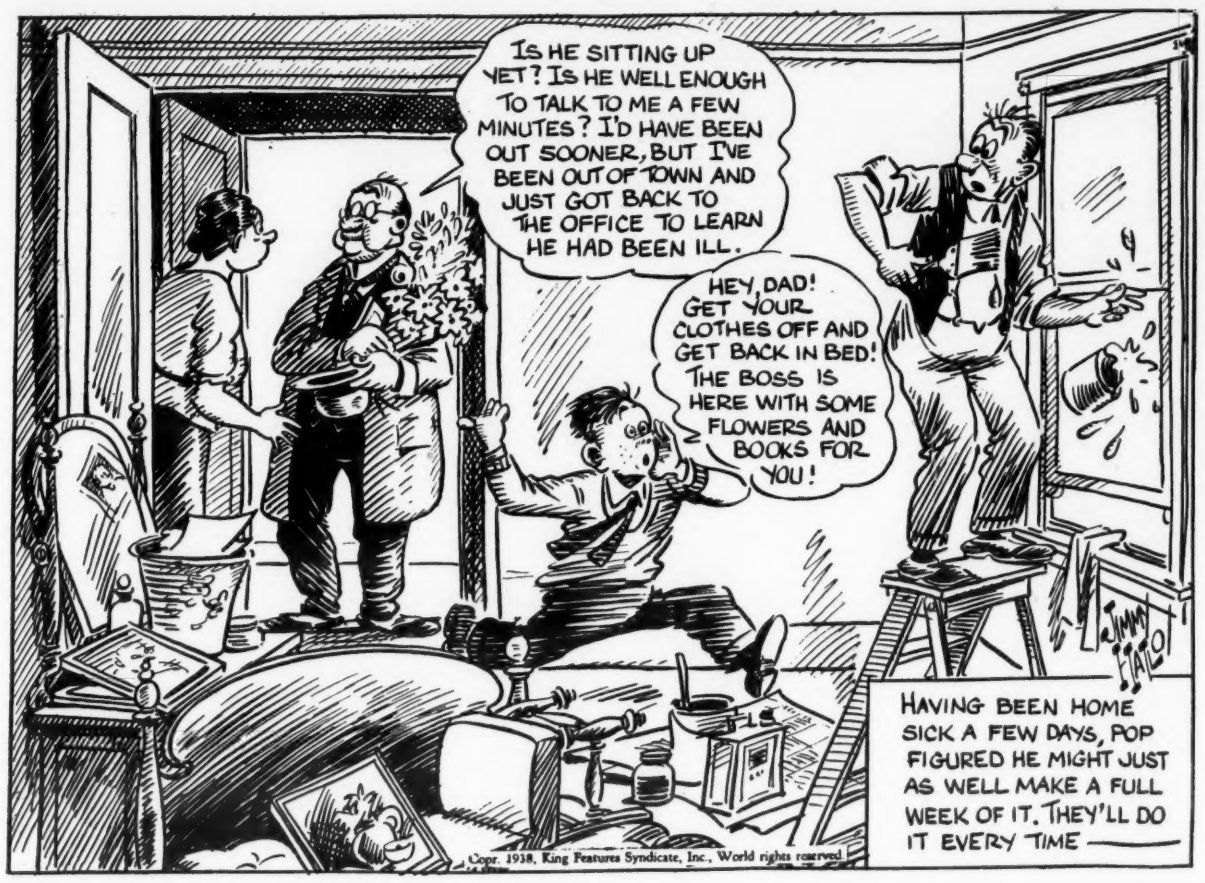
One of the college professors present made the statement that progress in the science of refrigeration has largely been confined to the last half century, and that refrigeration is on the threshold of an unparalleled development in industrial usage and application.

The last century has seen the rise of heat and heat treatment as major factors in industry; the next century, it is predicted, may see equal or greater revelation in the field of low temperatures and their application to the lightening of humanity's load and the "more abundant life."

As scientists explore further and further into the uncharted areas of low temperatures, industry follows with new uses, and business can take advantage of new opportunities for volume and profits.

It would appear that we are just entering into the initial years of the Era of Refrigeration.

They'll Do It Every Time . . . by Jimmy Hatlo


IS HE SITTING UP YET? IS HE WELL ENOUGH TO TALK TO ME A FEW MINUTES? I'D HAVE BEEN OUT SOONER, BUT I'VE BEEN OUT OF TOWN AND JUST GOT BACK TO THE OFFICE TO LEARN HE HAD BEEN ILL.
HEY, DAD! GET YOUR CLOTHES OFF AND GET BACK IN BED! THE BOSS IS HERE WITH SOME FLOWERS AND BOOKS FOR YOU!
HAVING BEEN HOME SICK A FEW DAYS, POP FIGURED HE MIGHT JUST AS WELL MAKE A FULL WEEK OF IT. THEY'LL DO IT EVERY TIME
JIMMY HATLO
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LETTERS

Helping New Appliance 'To Come Into Its Own'

Westinghouse Electric & Mfg. Co.
246 E. Fourth St., Mansfield, Ohio
Editor:

In several recent issues of AIR CONDITIONING & REFRIGERATION NEWS I have enjoyed reading your editorial comments on the present and future status of the electric dishwasher in the appliance industry. Your editorial comments and support of this new business in a publication as widely read and sincerely believed as AIR CONDITIONING & REFRIGERATION NEWS should certainly be deeply appreciated.

It is our feeling and, I am sure, the feeling of the other manufacturers, that the electric dishwasher is about to come into its own. Certainly, the distasteful job of doing dishes by hand is one to which the electrical appliance industry owes the American homemaker a solution. Since we believe that we have now found a dependable solution to hand dishwashing drudgery, your cooperation in helping us get this message across to the consumer is appreciated.

S. G. FISHER,
Manager, Dishwasher Sales

British Standards Group Called 'Unofficial'

Frigidaire
Edgeware Road, The Hyde
London, N.W. 9
10th June, 1938
Editor:

Whilst appreciating the desire of your always enterprising and informative Journal to give its readers up-to-the-minute news of refrigeration development in various parts of the world, I would draw your attention to a very misleading article on page 1 of your May 25 issue.

In referring to the "refrigerator drive opened in England" by the Electrical Development Association, you tie up with the perfectly accurate remarks made about the association's aims a statement of a "set of standards" set up by the "Domestic Refrigeration Standardization Committee."

The Electrical Development Association is, of course, a National Body of unimpeachable repute, with whom all the leading refrigerator manufacturers in this country are in pleasant cooperation, but the so-called Domestic Refrigeration Standardization Committee is a collection of private individuals with, to the best of my knowledge, after consultation with other leading manufacturers, no sponsorship from any of the principal refrigeration companies in this country.

Any person or group of persons is, of course, entitled to the expression of opinion which they think will benefit the community at large, but I think you will agree with me that such opinion should be published as a private opinion and not as representative of an industry. I think you will also find that the "committee" has no right to, even by implication, associate themselves with the activitives or standards of the Electrical Development Association.

Whilst writing to you, I am sure you will be interested to have information that we have this year launched on the English market a 2.1-cu. ft. household model at the hitherto untouched price of 22 gns. delivered and installed. The public acceptance of this model has been even better than we anticipated and it seems almost a certainty that although we have now just on one thousand people at Hendon, we shall be sold out of this model by the middle to the end of July.

C. F. DICKSON,
Managing Director

Standards Group Not Connected With E. D. A.

The British Electrical Development Association, Inc.
2, Savoy Hill, London, W.C. 2
16th June, 1938
Editor:

My attention has been drawn to the description headed "Refrigerator Drive Opening in England" given in your issue of May 25 and to the Electric Refrigeration Campaign organized by this association in conjunction with 11 leading manufacturers during the current season.

I am writing to point out that the so-called Domestic Refrigeration Standardization Committee, the objects of which are mentioned at some length in the article, has no connection with this association.

I believe the AIR CONDITIONING & REFRIGERATION NEWS has a considerable number of readers in this country, and I should be glad if you would find space in an early issue, to correct the false impression given by the article in question.

ALEX C. CRAMB,
Director and Secretary

Wants To Know How Locker Owner Profits

Tidmarsh Engineering Co.
Main & Congress, Tuscon, Ariz.
Editor:

I have been very interested in locker storage and wish to congratulate you on devoting your issue of June 8 to this subject.

As Norge distributor for the state of Arizona this has been recommended to us, but we have not, as yet, been able to convince ourselves of the merits of such an installation in Arizona, because we feel that due to the extreme distances involved, it would not be feasible for ranchers to come in 10 to 50 miles to avail themselves of such facilities.

There are three main articles which indicate that an installation of this type would cost between 10 and 12 thousand dollars for a 300-box installation. If these boxes are rented each for $12.50, it means a gross income of $3,650. I also understand that there is a charge of approximately 1 to 1½ cents a pound, and a daily movement of around 1,000 lbs., this would probably mean an extra income of $15 a day.

With these figures, it is difficult for me to appreciate how a net income of $12,000 a year may be realized. My reason for writing this letter is to find out the economics of the locker storage idea—how much money is invested, how much operating cost, insurance, depreciation, taxes, etc. From the figures shown in your issue of June 8, it looks as if it would be possible only for some good sales conscious butcher to invest probably $10,000 and have a nice living for himself.

Referring to page 12 and the article on the resentment to calling a desert cooler a "jillopy," you might add two terms to this which are rather common in Arizona—"swamp coolers" and "goat boxes."

P. M. TIDMARSH,
Vice President

Answer: For further figures on a locker storage plant operation, see page 4 of this issue.

Rules About Obtaining New Dealer Book

Electricity Supply Board
Public Relations Department
43, Merrion Square, Dublin
Editor:

I would be obliged if you would let me have a copy of "Appliance Selling Today" as advertised available to subscribers free of charge in May 4 issue of AIR CONDITIONING & REFRIGERATION NEWS.

The Board's subscription is payable through Messrs. Eason and Son, 40/41, Lower O'Connell St., Dublin.

E. A. LAWLER

Answer: The book "Appliance Selling Today" has *not* been distributed to all subscribers but has been offered as a premium with new or renewal subscription orders which are *paid in advance.*

Our records show that your subscription was entered in January; and it will be approximately six months before it expires. Instead of requiring you to renew your subscription for a full additional year, we will be glad to furnish the book on receipt of your check for $3.00 in payment of your renewal for another six months.

Please understand that we greatly appreciate your interest in this book. In making offers of this kind it is necessary to set up some rules, otherwise the cost would be prohibitive.

'Climax,' Not 'Simplex,' Makes Sears' Cooler

Climax Machinery Co.
121 E. Morris St., Indianapolis, Ind.
Editor:

In the June 22 issue of AIR CONDITIONING & REFRIGERATION NEWS you have an announcement of three air conditioners in the 1938 Sears' line. In this announcement you state that these machines are manufactured by the Simplex Machine Co., Indianapolis, Ind. These machines are manufactured by the Climax Machinery Co., Indianapolis.

R. T. SMITH

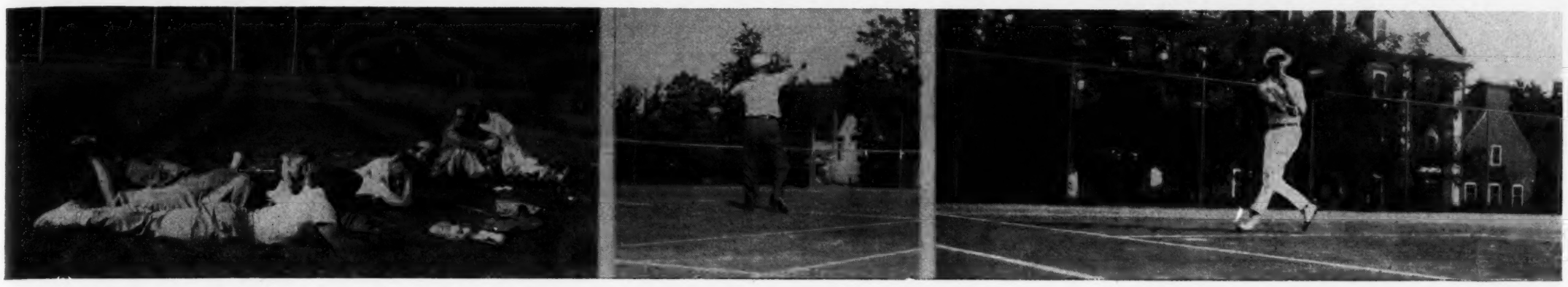
270 At Convention

Western Union Telegram
New York City
Editor:

Attendance figure 150 we gave you last week much less than total registration at ASRE and Food Conference. Total reached 270.

HELEN H. PEFFER,
American Society of Refrigerating Engineers

Tennis Was One of the Sports Indulged In By Engineers At Mid-Year Meeting



(1) The "gallery" at the A.S.R.E. tennis tournament. In this picture (we think) are such personages as Art Schellenberg of Alco Valve Co.; Hal McPherson of Electrimatic Corp.; Mrs. W. R. Hainsworth, wife of the head of the Servel Electrolux research laboratories; W. A. Steiger of Westinghouse; Editor George Taubeneck; Prof. N. R. Sparks of Penn State; and Helen Peffer of Refrigerating Engineering. Apparently the conversation of Mrs. Hainsworth and Miss Peffer was more interesting than the traditional Eustis-Redeker match which was in progress at the time this picture was taken. (2) Managing Editor Phil Redeker finds his feet very heavy near the conclusion of his "traditional" match with A. H. Eustis, head of the Virginia Smelting Co., in which he reversed a defeat suffered at the 1937 meeting. (3) The years prove no burden to Mr. Eustis as he crosses nimbly in the forecourt for a smashing volley. Since Mr. Eustis has inhaled a lot of sulphur dioxide in his time, he seems to demonstrate that, whether or not the gas is toxic, it must have a vitalizing quality.

UNCOVERING THE CONVENTION

NOTES ON THE A.S.R.E. ANNUAL MEETING

BY PHIL B. REDEKER

Wisecrack Backfires

Dan Wile of Savage Arms Co. tried to have some fun with his old friend Eddie McGovern of R. & H. Chemicals after the latter had given his paper at the opening technical session. Called upon by the chairman to discuss the paper, Dan said in friendly jest:

"I'm sorry I haven't had an opportunity to read the paper. However, I would like to comment on how much improvement and advancement Mr. McGovern has shown since he has enjoyed contact with the Society. (Titters.) I would also like to know if the tables referred to in his talk will be printed in the paper."

Replied Mr. McGovern:

"If Mr. Wile would have read the copy of the paper I offered him last night when I heard he would be called upon to discuss it, he'd know that the tables are included in it." (Loud laughter.)

* * *

Smart Audience At Last

Art Schellenberg of Alco Valve was gratified at the intelligence shown by the audience that watched his demonstration of refrigerant distribution in an evaporator by means of the special glass coil which has been placed on exhibition in many parts of the country. Art says that at most exhibitions he puts on some one comes up to ask where they can get a commercial model of the demonstration coil, or to inquire whether glass is a better medium of heat transfer than copper.

* * *

Rumor

Rumor has it that a former staff member of AIR CONDITIONING & REFRIGERATION NEWS, widely known and liked, will soon be back into contact with the industry. Official announcement is expected shortly.

* * *

Golf Champions

Wolverine Tube put up a huge new cup for the low gross golfers to fight over, and then sent down its chief engineer, Otto Klopsch, to win it. It was no setup for Otto, however, as L. J. Pitcher of the Hubbell Corp. and Prof. H. G. Venemann of Purdue were snapping at his heels all the way, and he had to get in with a 37 on the last nine to take the trophy. In light of the fact that he has not quite fully recovered from a recent serious illness, this must certainly be termed a remarkable achievement.

* * *

"Pitch" Pitcher was consoled, however, by the fact that he won the Kelvinator Trophy.

Several conventionites remarked that things didn't seem just right at the sessions without Irv Knudson of Detroit Lubricator Co., who rarely is absent from either the winter or spring meeting. Irv is convalescing from a sick spell and is expected to be back on the job in the near future.

* * *

Dr. Rentschler's talk on the Westinghouse "Sterilamp" and its possible use in conjunction with refrigerators to kill bacteria and retard mold growth provoked much interest. Among the most interested in this subject were G. J. Hopkins of McCray Refrigerator Corp. and Floyd C. Lowell of C. V. Hill & Co.

* * *

Colder Lockers?

Roger Sprague of Baker Ice Machine Co. and A. A. Geiger of York Ice Machinery Corp., both pioneers in refrigerated food storage locker plant work, had a long set-to one afternoon out on the lawn of the Nittany Lion Inn. One of the things that they apparently agreed upon is that there will be a tendency towards lower temperatures in both the freezer room and locker storage room.

* * *

Part of the entertainment Monday night consisted of a "questions and answers" spelldown, such as have been made popular through the "Prof. Quiz" and other current radio programs. The winner was Mrs. Crosby Field, wife of the president of the Society. (For other notes on the Field family, see the "Cold Canvass.")

Your correspondent was runner-up in this contest, but to achieve that position he made a number of very lucky guesses. He finally went out when he said that "F.O.E." stood for "Fraternal Order of Elks." That was the result of representations made to him in his youth, when he was told that "B.P.O.E." meant "Best People On Earth."

* * *

Indians and Snakes

Speaking of fraternal orders, following a certain incident in the early hours of Wednesday morning, a movement was on foot to nominate Dan Wile, Dick Townsend, D. P. Heath, and Charles Rittling for membership in the Noble Order of Redmen. Their war dance must have stirred the ghosts of the old Indian chiefs buried on nearby Nittany mountain.

* * *

Dick Townsend further qualified for the primitive life by leading an expedition on a rattlesnake hunt into the surrounding wild country. He claimed to have bagged a rattler, but didn't produce the evidence.

* * *

Court Battles

At the 1937 Spring meeting your correspondent marched forth to do battle in the tennis tournament only to be dumped out in the first round by virtue of a sound licking administered by A. H. Eustis, head of the Virginia Smelting Co., who is more than double your correspondent's age. Taunted by jibes of other conventionites, your correspondent challenged Mr. Eustis for a return match to open the 1938 tournament, which was agreed to and carried out, with the Virginia Smelting executive bowing after a close three-set match, in which about a dozen lucky shots were the determining factor. After the match, Mr. Eustis promised to practice more diligently for 1939.

Your correspondent was shoved into the finals with Dr. W. R. Hainsworth of Servel, who administered a brisk but thorough lesson in the game of tennis and emerged the champion. (However, we got a game off him, which is more than old B. T. Umor did.) Dr. Hainsworth, a mountain climber of note, is an example of how a man can keep in marvelous physical condition if he puts his mind (and legs) to it.

* * *

'Where Do We Go' - - -

Something in the nature of a controversy arose over the question of where the next summer meeting was to be held. One large and vociferous group carried on a regular political rally in favor of holding the convention at Skytop Lodge, Pa. Some thought had been given to holding the meeting at Purdue university, but this idea apparently was shelved. Oldtimers like Hal McPherson of the Electrimatic Corp. recalled that at one time the spring meeting was to be the "western" meeting of the society. And C. T. Baker is still exercising his southern charm in an effort to bring the convention to Atlanta.

Space For All-Industry Show To Be Offered On July 10; Daily Program Is Plan

(Concluded from Page 1, Column 3)

Annual conventions of several trade organizations, including Refrigeration Supplies & Parts Manufacturers Association and National Refrigeration Supply Jobbers' Association, are scheduled during the period of the exhibition. Several smaller trade associations, representing specific commodity groups in the refrigeration and air-conditioning field, also are said to be planning to meet during the same week.

Sponsors of the show selected what they believe to be the most desirable date for such an exhibition—late enough to permit all manufacturers to have their new products on display, and still early enough to give jobbers and other customers plenty of time to inspect the new merchandise and catalog and price it for their early season production or purchasing.

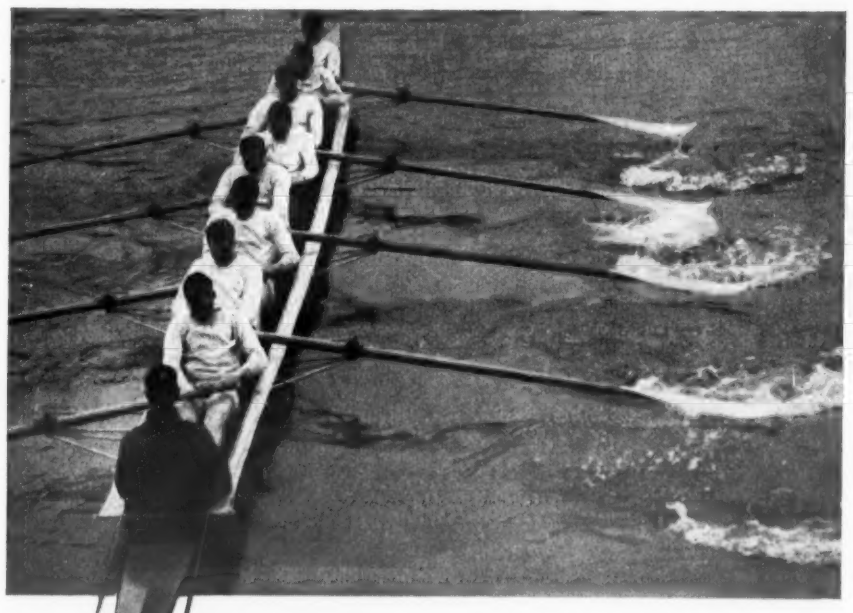
It will be a "selling" show, Mr. Knight said, timed to achieve direct sales results and located so as to attract the maximum number of attendants. Each participating manufacturer will be given a direct voice in the arrangements under which his products are to be displayed, and every opportunity to promote attendance from the fields in which he is interested.

In addition to the exhibition itself and the association meetings which will be held during the period, daily programs will be presented during the exhibition in an "Exhibition Theater" on the same floor as the show itself, Mr. Knight said.

This theater will be available, without charge, to all exhibitors, for the showing of movies, for lectures, demonstrations, or other entertainment uses. Time for use of the theater will be assigned by the exhibition manager in the order in which requests are made. Admission will be by ticket, and may be controlled by the individual exhibitor.

Use of a trained publicity man before, during, and after the show will be another service offered free to exhibitors, Mr. Knight said.

To assist manufacturer-exhibitors in contacting as many of those in attendance as possible, an official directory of exhibitors will be published and distributed to all visitors. An information booth, to facilitate the contacting of all registered visitors, also will be made available; and immediately after the show, a complete list of registered attendants will be sent to all exhibitors.



Pulling Together

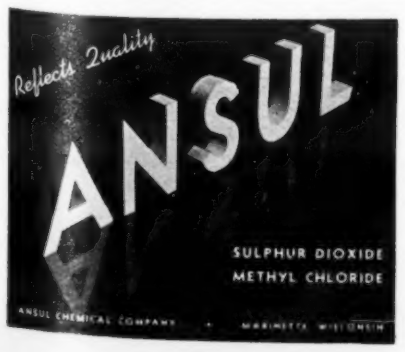
Teamwork counts in business as well as in sports. The spirit of teamplay in all Virginia Smelting Company departments, both manufacturing and distribution, has earned for us a widespread reputation for quick, dependable delivery. We've selected our dealers and jobbers carefully with this spirit in mind.

There is an added assurance to the service man: a jobber who stocks the Virginia Line of Quality Refrigerants also carries high quality merchandise for other replacement needs.

For Better Service

VIRGINIA SMELTING CO.
WEST NORFOLK, VIRGINIA

METHYLENE CHLORIDE
V-METH-L
EXTRA DRY ESOTOO



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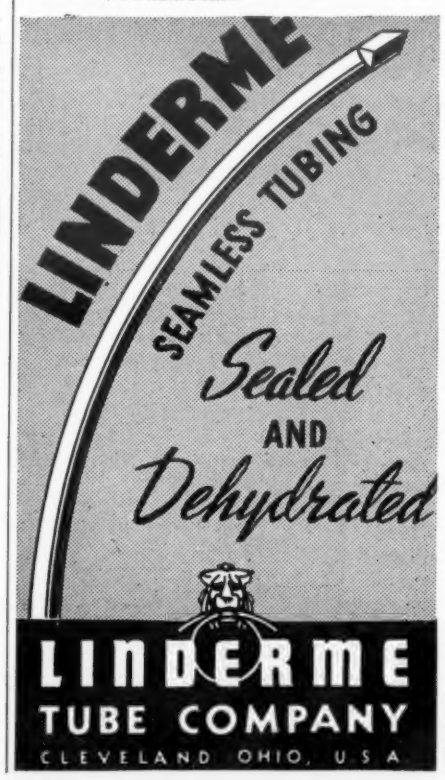


Service Methods

Application of the Heat Exchanger and Recommended Installation Practice

By A. F. Hoesel, Chief Engineer, Peerless of America, Inc.

THE use of a heat exchanger on the suction line of a cooling unit brings about two desirable results:

1—The suction vapor is increased in temperature and this allows the suction line to remain in a dry condition. In other words, the suction line temperature is increased in temperature above the dewpoint of the surrounding air sufficiently, so that moisture will not deposit upon the line.

2—The heat put into the suction vapor is subtracted from the heat of the refrigerant liquid prior to entering the expansion valve. This results in a decreased amount of flash gas immediately after the refrigerant liquid passage through the valve. This decrease in flash vapor results in a lower pressure drop through the coil and is desirable especially on coils having comparatively long circuits.

THEORY OF USE

Inasmuch as all refrigerating systems are generally operated to maintain a given amount of superheat in the suction vapor, a cooling unit without a heat exchanger in the suction line will ordinarily have to supply this superheat.

As superheat is the heat above that amount of heat necessary to vaporize the refrigerant liquid, it follows that in order to get superheat, a certain percentage of the cooling unit must be operated at a very low efficiency.

By means of a heat exchanger, the superheating function is transferred outside of the cooling unit proper and, therefore, the cooling unit operates at a higher overall efficiency. In this manner, a cooling unit equipped with a heat exchanger has a greater potential refrigerating capacity.

The popular conception of the conditions obtaining inside the refrigerant-circulating tubes of a cooling unit must be modified in many instances to conform with conclusions based upon investigations which have indicated that, under certain conditions of vapor velocity and at high heat loads, the flowing refrigerant vapor is not all that it appears to be as indicated by the surface temperature of the tube through which it is flowing.

Ordinarily it could be assumed that the refrigerant vapor, flowing through a tube, is a homogeneous mass throughout its entire cross section. Tests indicate, however, that this, in many cases, is far from the truth.

CONDITION OF VAPOR

It has been found that the refrigerant vapor adjacent the tube wall may be highly superheated, while the refrigerant closer to the center of the tube may be a mixture of both vapor and very finely divided refrigerant liquid, which might be termed super-saturated vapor. It may be presumed that the liquid is in the form of very fine globules suspended in the high velocity vapor.

With such a mixture of superheated and super-saturated vapor and with the superheated vapor adjacent to the tube wall acting as an insulant, we find that any finned section of the cooling unit having such mixture passing through it will be at a considerably higher temperature. A suction line, through which such mixture passes, however, will be at a much lower temperature and tend to sweat more readily.

The suction line can be at a lower temperature than that portion of the cooling unit immediately adjacent thereto because of the fact that the rate of heat input to the suction line is much less for equivalent length than the rate of heat input into the cooling unit. Therefore, the temperature differential between the center of the tube and its outside surfaces becomes much less.

'WATER ON HOT LID'

From all indications, the action may be compared to dropping water upon a hot surface. If the surface is sufficiently hot, such as a stove lid, it will be noticed that the water dances upon the surface and takes a rather long time to vaporize. Now, if we had a current of air of similar velocity to the refrigerant vapor passing by such drops of water, the similarity can be readily assumed.

It might be thought that the exact condition could be visualized by employing a glass tube evaporator. This is not true, since the rate of heat input through the glass tube, is too low to simulate the exact operation.

WHERE TO USE IT

On comparatively small capacity cooling units, the question as to whether or not a heat exchanger should be employed, might be a controversial one from the standpoint of cost as balanced against increased capacity. There are many cases in which cooling units, already installed, are just on edge. In these particular cases, there could be no question regarding the desirability of installing a heat exchanger in order to boost the cooling unit capacity, because in this manner, if the increase sought is not too great, it certainly would be less expensive to install a proper heat exchanger than it would be to install a cooling unit of larger capacity not equipped with a heat exchanger.

In the larger-sized cooling units, such as air-conditioning coils, there is generally no question as to the desirability of including a heat exchanger with the installation. The larger-sized cooling units generally are comprised of a plurality of circuits fed either by a multiplicity of expansion valves or by means of a single expansion valve connected to some sort of refrigerant distributor feeding all of the various circuits in the cooling unit simultaneously.

In general, all of these circuits terminate in a common suction line in which the heat exchanger would be placed.

CAPACITY QUESTION

The first problem confronting a party desiring to use a heat exchanger is that of capacity. As cooling units are rated in tonnage or B.t.u. capacity, it is rather common also to rate heat exchangers accordingly. In reality such ratings generally mean that the various connections for the suction line and liquid line, as well as the passages through the heat exchanger, are of sufficient size for the particular rating to keep the pressure drop, both on the liquid side and the vapor side, to a minimum.

There is no such thing as a definite and exact rating for a suction line heat exchanger, inasmuch as its capacity will vary with the amount of unvaporized refrigerant entering the same. This, in turn, depends upon the expansion valve temperature bulb position as well as the valve superheat adjustment. Furthermore, the capacity of the heat exchanger is affected by the temperature of the entering refrigerant liquid.

There are conceivable instances where a heat exchanger, rated at one ton capacity, would be of sufficient capacity to take care of a 5-ton cooling unit, providing its connections and passages were sufficient in size to handle the increased capacity.

MAIN FUNCTIONS

As mentioned previously, a heat exchanger has two functions:

1—To heat up the suction vapor.

2—To sub-cool the refrigerant liquid before entering the expansion valve.

Right here is where the difficulty comes in. Which of these two functions is the more desirable? If the elimination of sweating on the suction line is the gravest problem, we then use the heat exchanger as a sort of dryer and superheater for the suction vapor. In that case, place the thermal expansion valve temperature bulb in position B as indicated in Fig. 1.

In this case, for greatest efficiency of heat transfer in the cooling unit, we would adjust the thermal expansion valve to maintain a very low superheat and depend upon the heat exchanger to vaporize and superheat the super-saturated vapor passing from the cooling unit.

NORMAL HOOK-UP

This is the normal hook-up which is generally used, and, with a proper heat exchanger, gives a sufficient balance between the two functions referred to previously.

Assuming that we have a plural circuit cooling unit, such as an air-conditioning coil, in which the pressure drop between inlet and outlet is rather excessive, we would naturally be concerned with reducing the flash vapor at the expansion valve to an absolute minimum.

Therefore, if we place the thermal expansion valve bulb in position A, Fig. 1, we would have the heat exchanger operating with a higher rate of heat transfer and colder refrigerant liquid to the expansion valve.

Heat Exchanger Installation

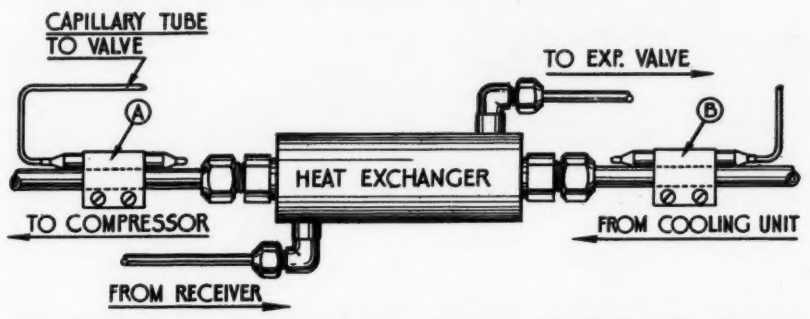
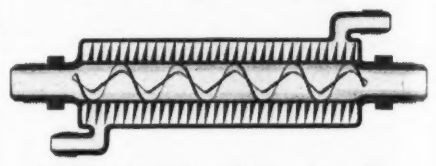


Fig. 1—Demonstrated here are two methods of placing the thermal expansion valve bulb when a heat exchanger is used. Mr. Hoesel explains why he prefers the "B" position.

Exchanger Tube



Cross-sectional view of the Peerless heat exchanger. Note rifling in central suction vapor passage.

Theoretically, this is the proper way to operate a heat exchanger in combination with a thermostatically controlled expansion valve adjusted to maintain a sufficient superheat in the refrigerant vapor leaving the heat exchanger.

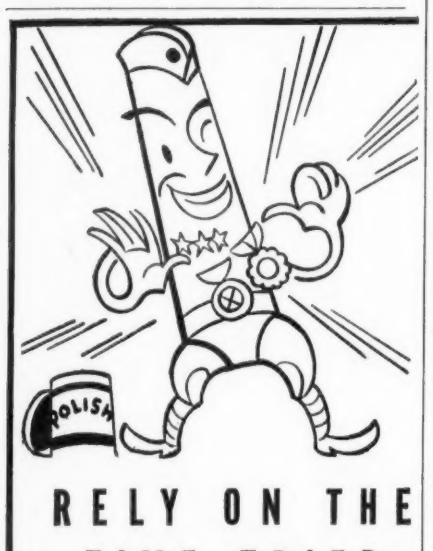
But in practice we generally find that such a hook-up gives an erratic operation and is accompanied by periodic overfeeding and underfeeding of the refrigerant to the cooling unit, especially if the valve orifice has a considerable excess capacity over that of the refrigerant vaporizing capacity of the system. (See article on "Hunting of Thermostatically Controlled Expansion Valves" on page 14 of the June 15 issue of AIR CONDITIONING & REFRIGERATION NEWS.)

THERMAL BULB

In general, it is advisable to place the thermal expansion valve temperature bulb in the position indicated in Fig. 1 as "B" and to adjust the thermal expansion valve to maintain a low superheat at its point of contact. This seems to satisfy the general demands put upon a heat exchanger, and entails less difficulty in respect to "hunting."

Fig. 2 is a cross-sectional view of a Peerless Heat-X-Changer (model A). Note that the central suction vapor passage is "rifled." This rifling, which provides a spiral passage for the super-saturated vapor, whirls the vapor and centrifuges the entrained globules of refrigerant liquid which, impinging against the comparatively hot tube wall, are vaporized thereby.

The outer surface of the suction vapor tube has 400 spines per inch of length and extending radially from the surface. The liquid refrigerant, passing through the heat exchanger, readily surrenders its heat to the suction vapor and is thereby reduced in temperature.



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A FEATURE FOR '39?

Experience has taught that moisture may be trapped in the intricate passages of the refrigerating mechanism in spite of careful baking and handling. To end trouble, why not build the cartridge of Activated Alumina *permanently* into the refrigerating system? ALUMINUM ORE COMPANY, (*Sales Agent:* ALUMINUM COMPANY OF AMERICA, 1908 Gulf Building, Pittsburgh, Pennsylvania.)

ALORCO

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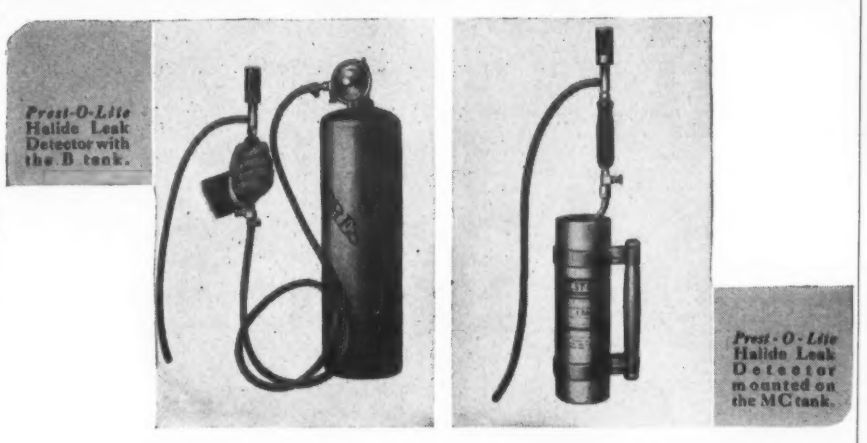

The *Prest-O-Lite* Halide Leak Detector is a positive, sensitive device for locating leaks of non-combustible halide gases in refrigerating and air-conditioning units. These gases—such as F-12 (Freon), F-21, F-114 and Carrene—are relatively odorless, tasteless and colorless, properties which render necessary a quick, sure method of locating leaks.

Ask your jobber or any Linde office for a demonstration and descriptive folder.

FEATURES
1 Assures instant reaction to any concentration of refrigerant gases.
2 No preheating, pumping or priming required.
3 Economical to use. Need not be lighted until actual testing begins.
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5 Quick clearing of flame after exposure to leaks.
6 Suction tube reaches easily into inaccessible places.
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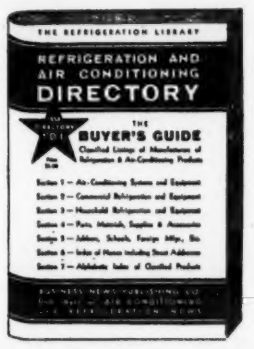
A Practical Reference Library on Refrigeration and Air Conditioning

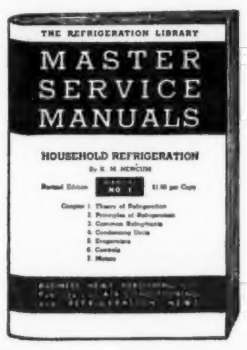
The books pictured on this page offer you a practical course of study in refrigeration and air conditioning at the lowest cost. Whether you are interested in household refrigeration or commercial refrigeration or air conditioning, or all three, there are books to meet your needs.

These books are written by experts in the fields they cover—by men who know not only the theory of their subjects but who have spent years of actual practice in the field. The ideas offered in these books represent the cumulative knowledge of technical training and field study, boiled down and presented in clear, understandable terms. They are practical books dealing with present-day types of equipment.

The beginner will find nothing confusing or difficult to understand in them. The experienced service engineer, dealer, and air-conditioning contractor will find them extremely valuable as reference texts. They are chock-full of time saving hints and discuss clearly and fully actual problems encountered in the field.



DIRECTORY NO. D-1—The first complete revision since 1935, listing manufacturers of all types of household and commercial refrigeration and air-conditioning equipment, parts, accessories, materials, supplies, and tools. Complete list of jobbers. 252 pages. Price $1.00.



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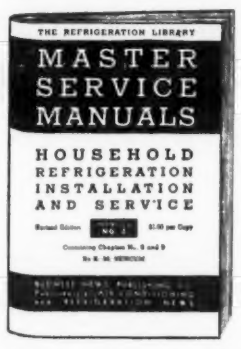

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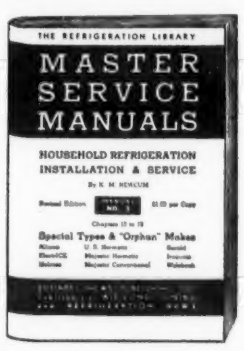
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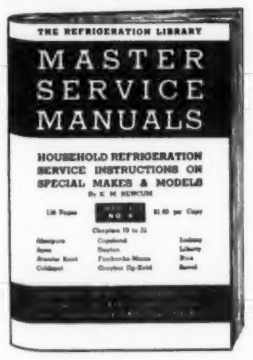
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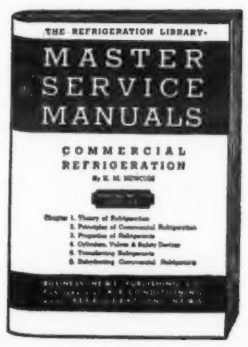

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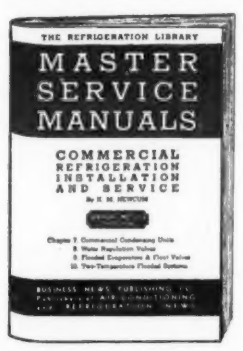

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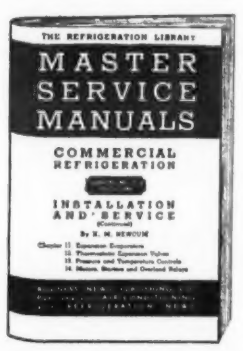

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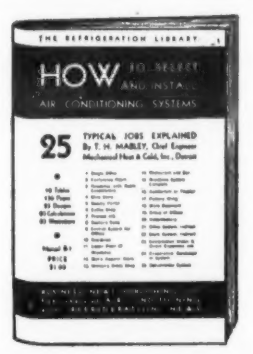

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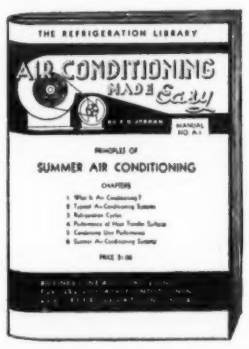

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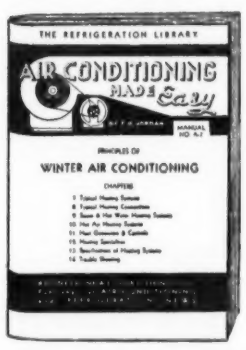

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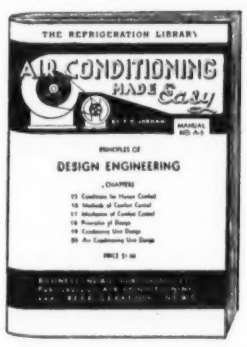

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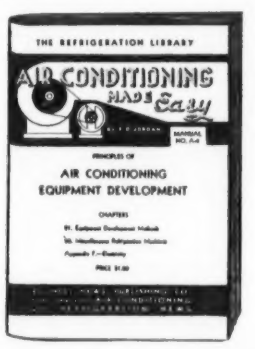

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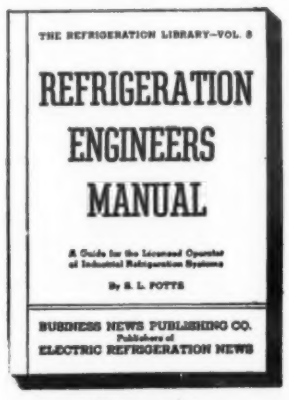
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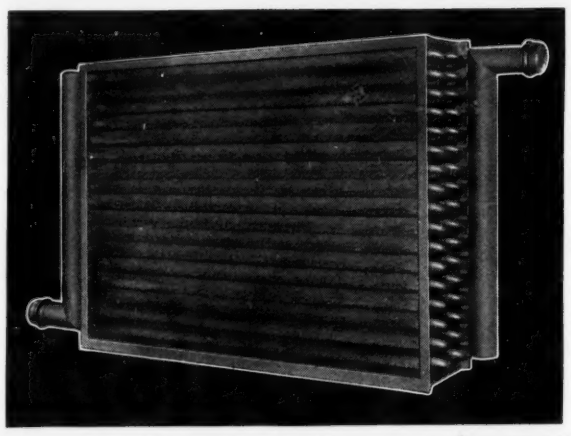

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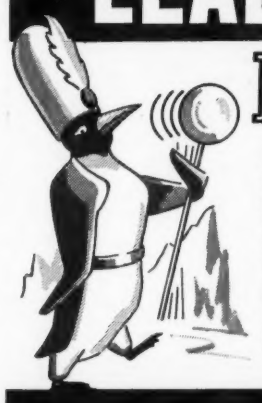

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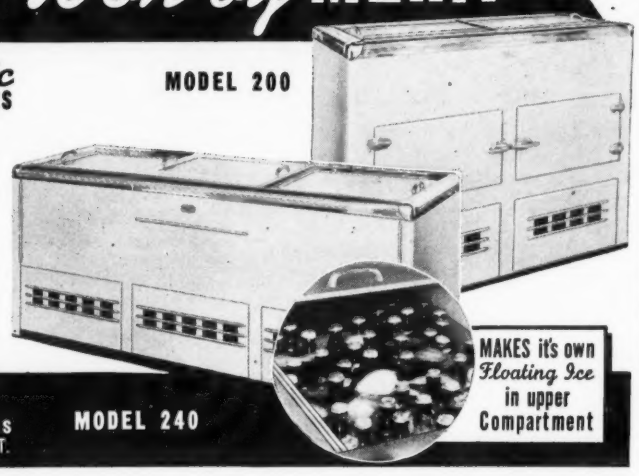

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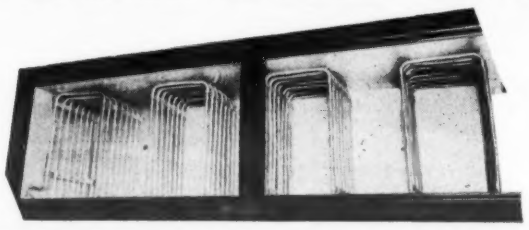

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Air Conditioning

Business of Pharmacist Gets 35% Boost By Air Conditioning

NEW ORLEANS—A business increase of 35% in all departments of Herbert's Pharmacy, and a 60% rise in soda fountain business, is directly attributed to installation of a General Electric air-conditioning system one year ago.

The installation, made by the Gulf Engineering Co. here, provides for winter heating, summer cooling, and between-season ventilation. The 15-ton system is equipped with two-speed motors, cooling the store and a suite of five doctors' offices during the day, and the store alone at night.

Control of the system is by means of a selector switch, which calls for heating, cooling, or ventilation.

G. G. Scheurmann, owner and operator of the store, states that the increase in his soda-fountain business has caused an advance in prescription business, due to the fact that the fountain is patronized by doctors and nurses from a nearby infirmary.

Sunload on the plate glass windows of the store is minimized by the use of venetian blinds.

Air Purifier At $59.50 Marketed By Airtemp

DAYTON, Ohio—Addition of the "Clean-Breeze" air purifier to the line of products manufactured by Airtemp, Inc., has been announced by company officials.

This unit, designed for installation in the window of either office or home, is said to remove dirt and dust from outside air and to circulate this air throughout the room.

It also can be used advantageously during the winter, for with a slight adjustment it will recirculate the warm air in a room, thus creating better air distribution, the company claims.

The Clean-Breeze unit, which may be plugged into any light socket or convenience outlet, is priced at $59.50 f.o.b. Dayton.

Novel Air Outlets Used On Ocean Liner System

HOBOKEN, N. J.—Novel air outlets consisting of polished glass cylinders about the size of a cigarette are installed high in the walls of the first-class dining room on the new Dutch ocean liner, "Nieuw Amsterdam," which docks here.

The outlets are part of a 300-ton Carrier air-conditioning system, said to be the largest afloat. Jean Michels, engineer and director of Carrier Continentale, affiliate of Carrier Corp., spent 18 months supervising the installation of the air-conditioning system in the 33,000-ton liner.

Bonwit Teller To Cool All 12 Floors

NEW YORK CITY—Tested successfully on the main floor, air conditioning will be extended to all 12 floors of Bonwit Teller & Co., Fifth Ave. department store, and to two new floors now under construction, reports Mrs. Hortense Odlum, owner.

Present conditioning system serves the main floor and beauty salon. This will be extended to all selling floors, work rooms, offices, and non-selling departments, Mrs. Odlum said.

Air conditioning and renovation program will cost $225,000, and will make Bonwit Teller the only specialty shop of its size to be completely air conditioned, it is said. When complete, the conditioning system will supply 400 tons of refrigeration and use 1,500 g.p.m. of water. Electric power load is approximately 500 hp.

New Device To Support Joists Cut By Ducts

CHICAGO—A new device for supporting joists which must be sawed to permit installation of heating or air-conditioning ductwork and equipment has been announced by Inland Mfg. Co.

Known as the Inland adjustable joist support, the unit consists of two heavy lag screws, machine-threaded for hexagonal nuts at the head, joined by a metal plate, and slotted to permit the screws to turn at any angle.

The metal plate is nailed to the joist, and pilot holes are drilled in adjoining joists. Lag screws are turned into these holes, washers and nuts are applied, and the joist is thus supported. It is claimed that only a 3-inch square of plaster need be removed for installation in a ceiling.

New Orleans Mortuary Uses 45-Ton System

NEW ORLEANS—An air-conditioning installation recently completed in the Lamana Panno & Fallo, Inc. mortuary by the Gulf Engineering Co. includes 45 tons of General Electric equipment.

No air is recirculated from the embalming rooms, as the system has sufficient capacity to handle 100% fresh air for these rooms.

Bowman Will Represent Jas. P. Marsh Corp.

ROCHESTER, N. Y.—A. R. Bowman has been appointed representative in this territory for Marsh steam specialties, air valves, gauges, thermometers, and industrial instruments, according to an announcement by the Jas. P. Marsh Corp., Chicago.

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Engineering

Causes of Copper Plating In Units And Methods For Avoiding or Inhibiting the Condition

STATE COLLEGE, Pa.—Causes of copper plating in refrigerating compressors and some suggestions as to how such a condition might be avoided were outlined to members of the American Society of Refrigerating Engineers at their semi-annual meeting here last week by E. W. McGovern of the R. & H. Chemicals Department, E. I. du Pont de Nemours & Co., Inc.

Mr. McGovern's paper, probably the first presented on a subject of growing importance before a technical society, discussed results of research and tests made by R. & H. and other concerns which have a vital interest in the subject.

Deposits of metallic copper on steel and cast iron parts in refrigerating compressors are occasionally noticed after machines have been in service for some time—generally two months to a year, Mr. McGovern said.

This condition is commonly referred to as "copper plating" and is sometimes called "copper transfer." While in many cases the deposits are only slight and give no trouble, at times the plate on cylinder walls and piston may be so severe as to cause the machine to bind.

Faulty and inefficient valve action may be caused by films of copper scraped from the cylinder walls by the piston or by plating on the discharge valve itself. Copper plate on seals may be troublesome in promoting leakage. Copper on main crankshaft bearings heavy enough to cause seizing has been reported.

"Work carried out in 1927 and 1928 by The R. & H. chemicals department in cooperation with Servel showed that copper transfer is caused by chemical solution of copper in lubricating oil, followed by decomposition of the dissolved organic copper compound, particularly on hot surfaces," declared Mr. McGovern.

AIR PROMOTES PLATING

"This work also showed that air in a machine might promote plating by oxidizing oil to substances having higher solubilities for copper; that thorough drying of a refrigeration system might, to a large extent, prevent copper plating but not necessarily eliminate it altogether.

"As a result of this work, it was suggested that oils used in refrigeration work should show low oxidizing tendency as determined by the slight oxidation test which measures the sludge formed by oil exposed to oxygen for 2½ hours at 200° C. (392° F.).

"It was recognized that the Sligh oxidation number was not always a sure index of the relative copper dissolving power of an oil, but, in the absence of a better method, it served as a general measure of copper plating tendency.

"Evidence existed indicating that copper was dissolved by certain constituents of the original oil, possibly the sludge forming constituents measured by the Sligh test, as well as by fatty acids formed by oxidation of the oils.

'SLUDGE OILS' A FACTOR

"Later research, in which corrosion of very thin metal films was observed by optical methods, showed that copper is corroded more rapidly by sludge forming oils; also that the sludge, but not the acids, formed by oxidation of oil depends mainly upon the percentage of aromatic constituents as opposed to the naphthenic and paraffinic. This was further evidence that an oxidation-sludge measuring test such as that of Sligh should be in some degree a measure of copper plating tendency.

"In 1936, Dr. C. E. Waring of Frigidaire adapted the Hellmut Fischer colorimetric 'dithizone' (diphenylthiocarbazone) method of analysis for copper to the determination of the relative copper dissolving powers of lubricants. This test, being a direct measure of copper solubility, is of value not only because it is an improvement over the Sligh and trial and error methods of oil selection, but also because it opens the way to more ready study of the factors influencing copper plating.

"The 1927-1928 work on copper plating, reports of experiences of machine manufacturers and service men, and recent research by A. A. Levine and F. L. Koethen employing the dithizone test are considered in this paper."

Theories of Causes of Copper Plating

At the time of the 1927-1928 research, said Mr. McGovern, methyl chloride and sulphur dioxide were the only refrigerants used to any great extent in small refrigerating systems employing copper tubing.

"Since even slight copper plating was but rarely encountered in sulphur dioxide machines, discussion of the subject centered around methyl chloride machines although the condition has since been encountered in machines using a wide variety of refrigerants and has even been reported in automobile engines," the R. & H. engineer pointed out.

The possible causes of plating proposed for investigation were, therefore, as follows:

(1) Particles of metallic copper, resulting from machining operations or wear, ironing out on bearing or rubbing surfaces.

(2) Water in the refrigerating system hydrolyzing methyl chloride to hydrochloric acid and methyl alcohol, the acid attacking copper to form copper chloride: iron then replacing copper in the copper chloride, the copper plating out.

(3) Air in the machine oxidizing methyl chloride to organic acids such as formic. These acids forming copper salts which then plate out copper on iron and steel.

(4) Stray electrical currents, particularly in machines operated by direct current, possibly in the presence of water, producing electroplating.

(5) Copper dissolved by certain constituents of some lubricating oils or by oxidation products of oils forming copper organic compounds which are decomposed, for example, by heat to form metallic copper.

NOT FROM 'IRONING OUT'

Before final proof was obtained that mineral oils are the primary factor, evidence as follows was advanced against the first four of the above-listed possibilities, according to Mr. McGovern.

"Ironing out" of fine particles of metallic copper, the first theory advanced, was disposed of as a primary cause by eliminating possible sources of such copper, by the use of efficient filters and by examination of oil from compressors which showed that metallic copper was not present in the oil when plating was just starting. However, there was evidence that some secondary "plating" especially on crankshaft bearings was caused by ironing out of metallic copper first plated out on cylinder walls and later scraped off by the piston.

Even before experimental work was started, it was considered doubtful that plating was caused by hydrolysis of refrigerant to form acid which in turn formed copper salts, in view of the fact that, at the time, only one refrigerating machine manufacturer out of 28 employing methyl chloride reported plating trouble and that, further, methyl chloride had been used satisfactorily for years.

Sulphur dioxide readily forms corrosive sulphurous acid with water and, by similar reasoning, severe copper plating might be expected in sulphur dioxide compressors but actually does not occur.

Further, hydrochloric acid attacks copper only in the presence of oxygen, that is, it dissolves copper oxide but not metallic copper, and air that might be present in a machine would thus be used up in dissolving a small amount of copper.

ACIDS NOT A FACTOR

Even if hydrochloric acid dissolved copper in the absence of air, water would be quickly used up in the reaction and little copper could be plated in a reasonably dry system.

The location of the plate on hot surfaces such as discharge valves pointed more toward decomposition of an organic copper compound than exchange of iron for copper from a copper salt. Some samples of methyl chloride from machines which were copper plating showed less than 0.001% of hydrochloric acid although the acidity was sometimes greater.

Laboratory tests storing copper-iron couples in contact with methyl chloride containing 0.2%-5% water over a period of 56 days at 40° C. failed to produce a plate on the iron although there was a slight blistering of copper at the point of contact with iron.

When eventually it was found that certain oils would not copper plate,

(*Continued on Page 14, Column 1*)

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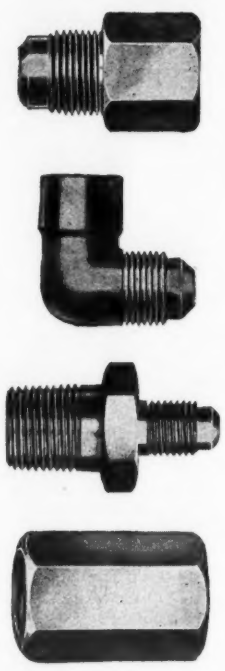
THE BUYER'S GUIDE



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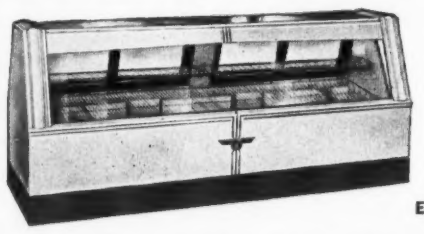

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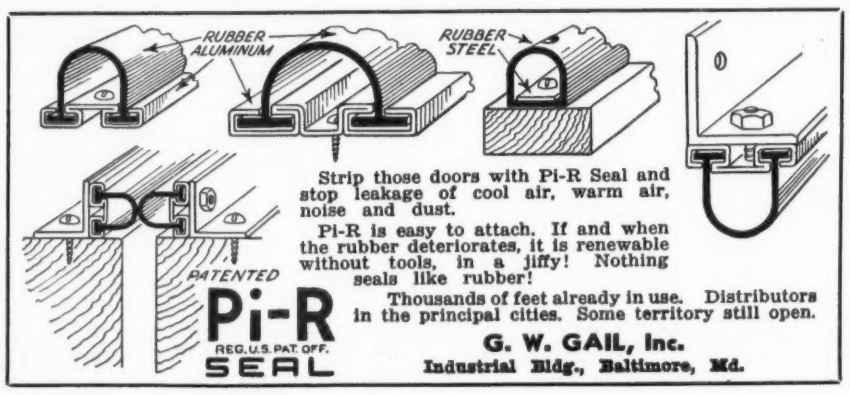

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Copper-Oil Compound Is Starting Point of Plating on Machines

(*Continued from Page 13, Column 3*)

machine tests were made with these oils in the presence of (a) moisture, (b) air and moisture, and (c) aqueous hydrochloric acid, without producing copper plating. Even a solution of copper sulphate in water, charged into a machine, failed to produce a significant plate.

Conversely, the oils which showed the greatest copper plating in some cases continued to plate, although to a lesser degree, when extreme precautions were taken to free the machines of air and moisture.

No evidence was found to show that copper plating could be associated with oxidation of methyl chloride to organic acids. A mixture of methyl chloride and air was bubbled through oil for 94 hours at 212° F. in the presence of finely divided iron and copper; tests failed to show the presence of formic acid, acetic acid or other water soluble acids nor were copper compounds of such acids found in machines which were copper plated.

Stray electrical currents were eliminated from serious consideration as a possible cause by analysis of the theory and a few tests. No disproportion in copper plating was found between machines operated by alternating current and those run by direct current. Careful insulation of the motor and other electrical equipment from the refrigerating system proper did not affect copper plating.

Effect of Oil on Copper Plating

In considering various possibilities, P. J. Carlisle and J. L. Fahs proposed that plating depended on solution of copper by lubricating oil. The fact that mineral oils may be oxidized to organic acids was well known and tests showed that after oils were oxidized by air in the presence of copper, they contained dissolved copper.

Copper compounds of oxidized oils when heated to temperatures of 80°—100° C. (176°—212° F.) precipitated metallic copper. A stable unoxidized oil was heated with copper filings for 100 hours at 212° F. and no detectable amount of copper was found in the oil.

Of related interest is the fact that copper, iron, and certain sulphur compounds which are present in some oils are known to catalyze the oxidation of oils.

Oils were examined for copper by microscopic chemical analysis; any copper present in an ashed sample was converted to copper mercury thiocyanate which has a typical crystal form identifiable under the microscope.

Demonstration that copper existed in oil as organic compounds (that is containing carbon) was effected by showing that inorganic copper salts are essentially insoluble in oil and that dissolved copper compounds which could not be removed from oil by intensive washing with water must be organic and derived from oil and copper.

Direct evidence on the mechanism of copper transfer was obtained when examination of oil samples from compressors which were plated showed that copper was present and that all of it was there as oil-soluble, water-insoluble compounds as shown by the following data:

Sample	Per Cent Hydrochloric Acid	Per Cent Free Organic Acid Calculated as Oleic	Per Cent Combined "Oleic"	Total Copper
1	0.074	0.48	2.0	0.04 %
2	0.004	0.14	6.01	0.005%

The relatively high percentage of hydrochloric acid in sample No. 1 would indicate that the refrigerating system contained considerable moisture.

As soon as suspicion was directed toward the more readily oxidizable oils, the Sligh oxidation test was suggested as a guide and laboratory machine tests were started comparing, under a variety of conditions, the oils more resistant to oxidation, (generally "higher refined") with those less resistant. Results are shown in Table 1.

Exact data on Sligh numbers of listed oils are not available but in general those called "higher refined" had a Sligh number of less than 2, while the "lower refined" in general run over 10.

It may be seen that higher refined oils were not associated with plating while the lower refined usually were. However, correlation between Sligh number and plating tendency was not exact and experience has shown that there are important departures from the rule.

It may also be noted that lower refined oils still plated when extra precautions were taken to remove air and moisture although, in general, moisture increased the amount of copper deposited.

In field tests using soda lime dryers, copper plating with lower refined oils was almost entirely prevented, but it was not definitely proved that this was due to elimination of moisture or acidity rather than some chemical action of soda lime on copper compounds. Dithizone tests have shown that solubility of copper in oil is increased little or not at all by the presence of moisture.

"It would therefore appear that water is a factor in causing the copper-oil compound to precipitate metallic copper," said Mr. McGovern. "This agrees with the report of a representative of an oil manufacturer that an oil was used for months without plating in a dry system although green with dissolved copper, but when water was added to this system, the copper quickly precipitated.

"Other substances may have the effect of water in causing precipitation of copper and some suspicion has been directed toward methyl alcohol but we have no direct evidence to this effect. Plated machines containing methyl alcohol may be suspected of containing water since the alcohol is added to prevent freezing of water.

"The fact that plating is practically non-existent in sulphur dioxide machines and has not been noticed in isobutane machines, even those containing moisture and low grade oil, may indicate that the halogenated hydrocarbons and methyl formate, all of which may be regarded as acid derivatives of hydrocarbons, aid in the precipitation of copper from oil solution through hydrolysis in the presence of water to alcohols and acids."

The absence of plating in wet isobutane systems containing alcohol added as an antifreeze would point toward acid as the precipitating aid. Isobutane does not hydrolyze to an acid and apparently temperatures are not sufficiently high to cause precipitation from the oil by heat alone.

"Another possible explanation of absence of plating in sulphur dioxide and isobutane compressors is that these refrigerants in some way aid in holding copper in solution. This

(*Concluded on Page 15, Column 1*)

Table 1—Laboratory Machine Tests—Conditions Affecting Copper Plating

Test No.	Brand Of Oil	Degree of Oil Refinement	Length of Test Run	Condition of Test*	Degree of Copper Plating
1	No. 1	Lower	10 Weeks	Copper Filings Placed in Machine	Trace, Valve
2	No. 1	Lower	10 Weeks	Copper Filings Placed in Machine	Slight, Valve
3	No. 1	Lower	6 Weeks	3 cc. Water Added	None
4	No. 1	Lower	6 Weeks	3 cc. Sulphur Dioxide	Slight, Valve
5	No. 1	Lower	5 Weeks	3 cc. Water, Filter	Slight, Valve
6	No. 1	Lower	5 Weeks	3 cc. Water, 1½ cc. SO_2, Filter	Slight, Valve
7	No. 1	Lower	2½ Weeks	3 gm. Copper Sulfate, 3 cc. Water	Slight, Valve
8	No. 1	Lower	2½ Weeks	3 cc. Concentrated Hydrochloric Acid	None
9	No. 2	Lower	9 Months	No Special Precaution	Heavily Plated
10	No. 2	Lower	10 Weeks	No Special Precaution	Heavily Plated
11	No. 3	Higher	2½ Weeks	No Special Precaution	None
12	No. 3	Higher	3 Weeks	3 cc. 28% Hydrochloric Acid	None
13	No. 4	Medium	12 Months	No Special Precaution	Plated
14	No. 5	Higher, Special	3 Months	No Special Precaution	None
15	No. 5	Higher, Special	6 Months	No Special Precaution	None
16	No. 6	Medium	11 Days	Dry	Trace on Valve
17	No. 6	Medium	11 Days	3 cc. Water Added	None
18	No. 7	Medium	11 Days	Dry	None
19	No. 7	Medium	11 Days	3 cc. Water Added	Small Amount on Valve, Cylinder Trace
20	No. 8	Lower	11 Days	Dry	Trace Cylinder & Valve
21	No. 8	Lower	11 Days	3 cc. Water Added	Heavy on Valve
22	No. 9	Higher, White	11 Days	Dry	None
23	No. 9	Higher, White	11 Days	3 cc. Water Added	None
24	No. 10	Higher, White	11 Days	Dry	None
25	No. 10	Higher, White	11 Days	3 cc. Water Added	None
26	No. 11	Lower, Yellow	11 Days	Dry	Small Amount Valve
27	No. 11	Lower, Yellow	11 Days	3 cc. Water Added	None
28	No. 12	Higher, White	11 Days	Dry	None
29	No. 12	Higher, White	11 Days	3 cc. Water Added	None
30	No. 13	Medium	11 Days	Dry	Small Amount, Valve
31	No. 13	Medium	11 Days	3 cc. Water Added	Trace, Valve
32	No. 12	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
33	No. 12	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
34	No. 12	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
35	No. 9	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
36	No. 9	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
37	No. 9	Higher, White	8 Weeks	(Ordinary servicing to remove air, water)	None
38	No. 2	Lower	8 Weeks	(Ordinary servicing to remove air, water)	Heavy Valves & Cyl.
39	No. 2	Lower	4 Weeks	(Ordinary servicing to remove air, water)	None
40	No. 2	Lower	4 Weeks	(Ordinary servicing to remove air, water)	Light on Valves
41	No. 14	Higher, Special	5 Weeks	(Ordinary servicing to remove air, water)	None
42	No. 14	Higher, Special	5 Weeks	(Ordinary servicing to remove air, water)	None
43	No. 1	Lower	8 Weeks	(Ordinary servicing to remove air, water)	Heavy on Valves, Rings, and Cylinders
44	No. 1	Lower	7 Weeks	Specially Dried and Flushed with Nitrogen to Remove Air†	Light on Valves
45	No. 1	Lower	7 Weeks	Specially Dried and Flushed with Nitrogen to Remove Air†	Medium on Valves and Cylinders
46	No. 1	Lower	7 Weeks	Specially Dried and Flushed with Nitrogen to Remove Air†	Light on Valves
47	No. 1	Lower	4½ Weeks	Specially Dried and Flushed with Nitrogen to Remove Air‡	Light on Valves
48	No. 1	Lower	4½ Weeks	Specially Dried and Flushed with Nitrogen to Remove Air‡	Light on Valves

*All machines run at high condensing temperatures and pressures. Carefully dried and freed of air unless otherwise specified, methyl chloride refrigerant.
†Five pounds suction pressure.
‡Twenty pounds suction pressure.

Good Oil Plus Freedom From Moisture & Air May Keep Units From Copper-Plating

(*Concluded from Page 14, Column 5*)

would appear particularly to be the case with sulphur dioxide which hydrolyzes to an acid and which runs high head temperatures. Oils from sulphur dioxide machines show the presence of copper but precipitation is rare.

"Tests No. 4 and No. 6, Table 1, while not conclusive, would indicate that sulphur dioxide may not show this inhibitory effect when mixed in small percentages with other refrigerants."

These first researches also showed high temperatures to be a factor in copper plating, probably in increasing copper corrosion as well as in promoting decomposition of copper compounds, according to Mr. McGovern. Plating was more prevalent in machines operating at high head temperatures, being practically nonexistent in water cooled machines, while air cooled machines operating at low suction pressures (higher ratio of compression) were more apt to be affected.

Plating is most common on hotter parts such as discharge valves and also occurs where heat may be developed by friction.

"Of the factors, oil selection, moisture, air, and temperature, the last is least subject to control and existing practices need not be changed in this respect if the first three factors are controlled," declared the speaker.

"Moisture and air are foreign to a refrigerating system and should be eliminated not only because of copper plating but also because they may produce other bad effects such as corrosion, oil sludging, high head pressures, and ice blocked equipment.

"Some objections were raised to oil selection by the Sligh test on the grounds that some of the lower priced oils having Sligh numbers of 10 to 15 were quite resistent to copper plating, presumably because of low solubility for copper, and gave satisfactory service and higher refined white oils are higher priced.

"Also, it has been claimed that the higher refined oils have less lubricating value, but in spite of this claim they appear to have given satisfactory lubrication. Good comparative plating records of pale yellow oils may have been at least partly due to care in drying and removing air from the refrigerating system, but there sometimes were undoubted differences in copper solubilities not predictable by Sligh numbers.

"The dithizone method directly measuring copper solubility therefore, is a better method of oil evaluation."

The dithizone test, as explained by Mr. McGovern, depends upon the violet color of copper dithizonate in carbon tetrachloride solution.

The recent research using the dithizone test gave more conclusive proof of many of the major factors influencing copper plating, above discussed, and in addition, disclosed other conditions affecting solubility. These factors were summarized by Mr. McGovern as follows:

Factors Increasing Amount of Copper Dissolved

High Temperatures
Oxygen
  Dry Air
  Sligh oxidized oil
  Oil from can, opened, partly emptied and allowed to stand
Increased Copper Surface
Low refined oils

Factors Decreasing Amount of Copper Dissolved

Lower Temperatures
Absence of Oxygen
  Thorough Purging
  Nitrogen or Refrigerant Atmosphere
Chemical Inhibitors
Decreased copper surface (copper parts tin plated)
Higher refined oils

Factors of Little or No Effect on Amount of Dissolved Copper

Methyl Alcohol
Methyl Chloride
Copper oxide coating (heat scale) on copper (possibly a slight decrease in copper dissolved)
Moisture
Acidity developed on oxidizing oil
Viscosity (high viscosity oils possibly dissolve less copper)

Table 2 lists copper solubilities in oils commonly used at the present time. All of the oils are specified to be essentially neutral, odorless, free from saponifiable matter and to be dry enough to have a dielectric strength of 25,000 volts or better. Those oils with the same brand numbers are of the same origin, but of different viscosities.

With the possible exception of the oils numbered 18, copper solubility in oils of the same series appears to decrease with increase in viscosity.

Effect of Oxidation of Oil

"Evidence gathered indicates not only that partial oxidation of the oil produces substances capable of holding copper in solution but also that there occurs a further breakdown which tends to precipitate copper, in which both oxygen and high temperatures have a part," Mr. McGovern stated.

"Although oxidation of oils is said not to form considerable quantities of water below 450° F., it is possible that some water might be formed by this method in an otherwise dry but not oxygen-free system, thus introducing the effects of water.

"One sample of oil stored for some months in a partially filled can was shown to have a higher corrosive effect on copper than fresh samples of oil taken from a sealed can. A sample of the old oil after sodium refining was at least as non-corrosive as fresh oil. The sodium treatment would remove water and oxygen from the oil as well as 'refine' it.

Copper Plating Inhibitors

"It was found that corrosion of copper was inhibited when certain chemicals were added to the oils, probably because of scavenging of oxygen or an anti-oxidant effect.

"After a one-month run with one type of oil, using ordinary precautions to keep the system air and moisture free, the machine was badly plated. The machine was then cleaned and recharged with methyl chloride and with the same type of oil containing 0.1% inhibitor No. 1.

"After 65 days the machine showed slight traces of plating but probably could have been run indefinitely without serious plating.

"It was rather expected that a film of copper oxide on the copper would cause oils to pick up copper more rapidly. Data taken would indicate that perhaps the opposite is true in the case of the type of oxide or scale that may be formed by heating copper in an open flame until it has been completely oxidized on the surface.

"Neither traces nor appreciable quantities (several drops per sample) of water in oil appear to have significant effect on copper corrosion.

"No correlation was found between copper solubility and acidity developed by oils on heating, nor did copper appear to tend to reduce acidity to a constant figure. There was no constant relationship between acidities of Sligh oxidized oils and copper solubility."

Conclusions and Recommendations

"It is believed that sufficient data are presented to show that copper plating can be avoided by making sure that the charge in a refrigerating system consists of a good grade of oil, pure refrigerant, and nothing else," said Mr. McGovern in drawing his discussion to a conclusion.

"Because of cost factors, there may be desired, and there probably can be had, a certain degree of flexibility in selecting lubricants according to their copper dissolving power. That is, it may be possible and advisable to use a less expensive oil of relatively high corrosive effect on copper in certain applications where the oil will give satisfactory service.

"Systems having little or no copper exposed to oil, machines operating at moderate temperatures (that is, water cooled heads), and systems which are fairly sure to be essentially free of moisture and air (that is, assembly of complete unit under careful factory control) might give satisfaction with fairly corrosive oils that would show failures when used under less favorable conditions (that is, in commercial compressors which might be used on field assembled units subjected to uncertain care in drying and evacuating).

"An oil showing very low solubility for copper certainly cannot eliminate all the bad effects of moisture; its use, as compared to an oil of moderate copper solubility should be considered only as a degree of added insurance against plating of an occasional contaminated unit, as being somewhat further removed from the very corrosive oils which appear to plate under almost any conditions, and in being generally less subject to decompositions and sludging.

"Advisable limits on copper-oil solubility, and moisture content and air content of the refrigerating system have not been established. These, as above mentioned, can be flexible to a certain degree.

"Also we have not run sufficient machine tests correlated with laboratory tests to allow suggestion of limits, although long experience has shown that methyl chloride units containing a maximum of about 0.015% water are probably sufficiently dry.

"When applied according to the described procedure, the dithizone test is useful, but requires further development so that sufficiently reproducible results can be obtained by the analyst to make practical its use for oil specifications.

"A specification test method for copper solubility was not developed in this research. However, we understand that several manufacturers of refrigerating equipment and oil refiners are using for control a test devised by Dr. Waring of Frigidaire, in which observation is made of elapsed time before a test for copper is obtained when 50 cc. of oil contained in a tightly stoppered test tube, of a size to give an air space of about 1 inch at the top, is heated at 200° F. in contact with 20-22 ft. 22-gauge clean copper wire—using 1 cc. of oil and 1 cc. of fresh dithizone reagent (0.05 gm. dithizone per 100 cc. redistilled carbon tetrachloride).

"An oil that will stand up 72 hours under this test is said to have a reasonably low corrosive effect on copper."

Table 2—Solubility Of Copper In Various Oils

Brand of Oil	Color	Viscosity Saybolt Seconds 100° F.	Sligh No.	No. of Samples Tested	Standard Vented Tube Tests, 200° F., Average Copper Content Mg/Liter — As Rec'd	4 Days	1 Week	2 Weeks	1 Mo.	Acidity Developed Mg/KOH/gm After 1 Month Test	By Sligh Test
15	Pale	240	3	7	4	..	20	29	457	.27	1.09
16a	Yellow	150	10	..	11.5	..	..	..	..	..	..
16b	Yellow	290	10	2	2.5	10	12	..	14	.24	1.2
17a	White	250	0	2	..	10	13	11 (3 weeks)	13	.42	1.85
17b	White	320	0	..	..	..	9	10	12	..	2.30
18a	White	140	0	1	..	3 (2 days)	16	..	13	..	2.07
18b	White	210	0	1	..	..	16	..	21	..	2.55
18c	White	330	0	1	..	..	6	27	22	..	2.57
19a	Pale	200	..	1	..	..	12	28	29	..	1.66
20a	Pale	150	12	2	..	..	10	30	49	.41	1.43
20b	Pale	320	..	..	..	..	7	11	21	.11	..
20c	Pale	310	9	3	8 (1 day)	12	10	25	29	.81	2.0

THE BUYER'S GUIDE

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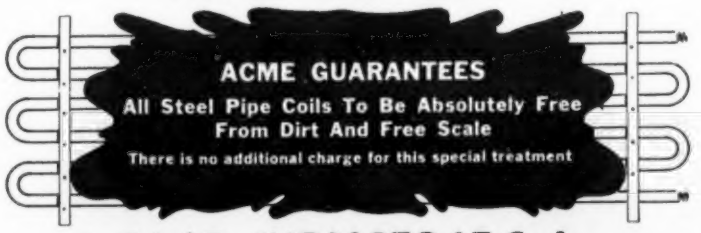

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